MARINE CORPS Gazette MAY 1945 30C

THIS MONTH'S COVER

The Capture of the "Reindeer."

Artist: S/Sgt. John Clymer

"On Tuesday the 28th Ulto. being then in Lat. 480 36′ N. and longitude 110 15′ W. we fell in with, engaged, and after an action of 19 minutes captured His Britannic Majesty's Sloop of War, the *Reindeer*, William Manners, Esqr., Commander . . ."

These terse words began the report of J. Blakesley, Captain of the USS *Wasp*, concerning a brief but bloody sea duel off the coast of France in June, 1814. This duel between HMS *Reindeer* and the USS *Wasp* is memorable for Marines because it is an excellent illustration of the Marines' functions of repelling enemy boarders and of covering boarding parties on enemy vessels. And, in addition, the musketry of the 16-Marine detachment, stationed in the tops of their vessel, contributed much to the final victory of the *Wasp*.

The Marines aboard the *Wasp* were commanded by Sergeant William O. Barnes. They were two corporals, two musics, and 11 privates. Stationed throughout the 19 minutes of action in the masts of their ship, their accurate muskets picked off British officers and men in every part of the *Reindeer's* deck. The British attempted three times to board the *Wasp*. Captain Manners, the gallant commander of the British ship, twice had been wounded in the legs and thighs and most of his officers were dead when he attempted the final boarding. The fire of Marines in the topsails was obliterating the men on his decks and he called, "Follow me, my boys, we must board them." He began to climb into the rigging and was killed by two shots from the muskets of the *Wasp's* Marines.

All of the officers of the *Reindeer* and most of her crew were dead or wounded when her ensign was hauled down at 3:45 P.M.

(Reprints of this cover suitable for framing will be furnished upon receipt of 10c in cash or stamps to cover cost of handling and mailing.)

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THE MARINE CORPS
THE PROFESSIONAL MAGAZINE
FOR UNITED STATES MARINES

Gazette

MAY 1945

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NEXT MONTH IN THE GAZETTE

¶ Recent issues of the GAZETTE have carried articles to help officers answer questions about benefits available to veterans under the G.I. Bill. Another in this series, "Booby Traps in Small Business," by Captain Albert C. Murphy, will be presented next month. In his article, Capt. Murphy, former manager of the First National Bank and Trust Company of New Haven, draws a parallel between military life and the running of a business, and tells how returning servicemen can avoid pitfalls in business ventures.

¶ This issue of the GAZETTE contains an article concerning Guam, dealing with communications there. Another article concerning the Guam operation, "Battle of Banzai Ridge," by 1st Lieutenant A. A. Frances, will be published in the GAZETTE for June. This account of the taking of Banzai Ridge rates as one of the best action stories we have published.

¶ Major J. A. Donovan, Jr., a frequent contributor to the GAZETTE, presents some ideas on shipborne landing teams in "Efficient Use of Time at Sea," in next month's issue. He tells how best to use the time spent on board ship to prevent "confusion, inefficiency, and friction resulting in harassed troops that arrive at the target area tired and disgruntled."

¶ The tremendous job of supplying our Corsairs, Hellcats, and Helldivers requires an organization "whose beginnings are found in factories, mines, arsenals . . . and whose end product is the repair of a plane on Leyte." The quotation is from "Marine Aviation Supply," by Captain Edward T. Butler which will appear next month. In his article Capt. Butler describes the complex organization necessary to "keep 'em flying."

¶ In "Tanks on Iwo," on page 8 of this issue, Major John L. Frothingham tells that tank companies knew enough about terrain and defenses to leave almost all their indirect fire control equipment with the rear echelon. In next month's GAZETTE, Major John T. Monzani, F.A., tells how Army tank battalions employ indirect fire, and describes a theoretical battle to illustrate his points.

★ ★ ★

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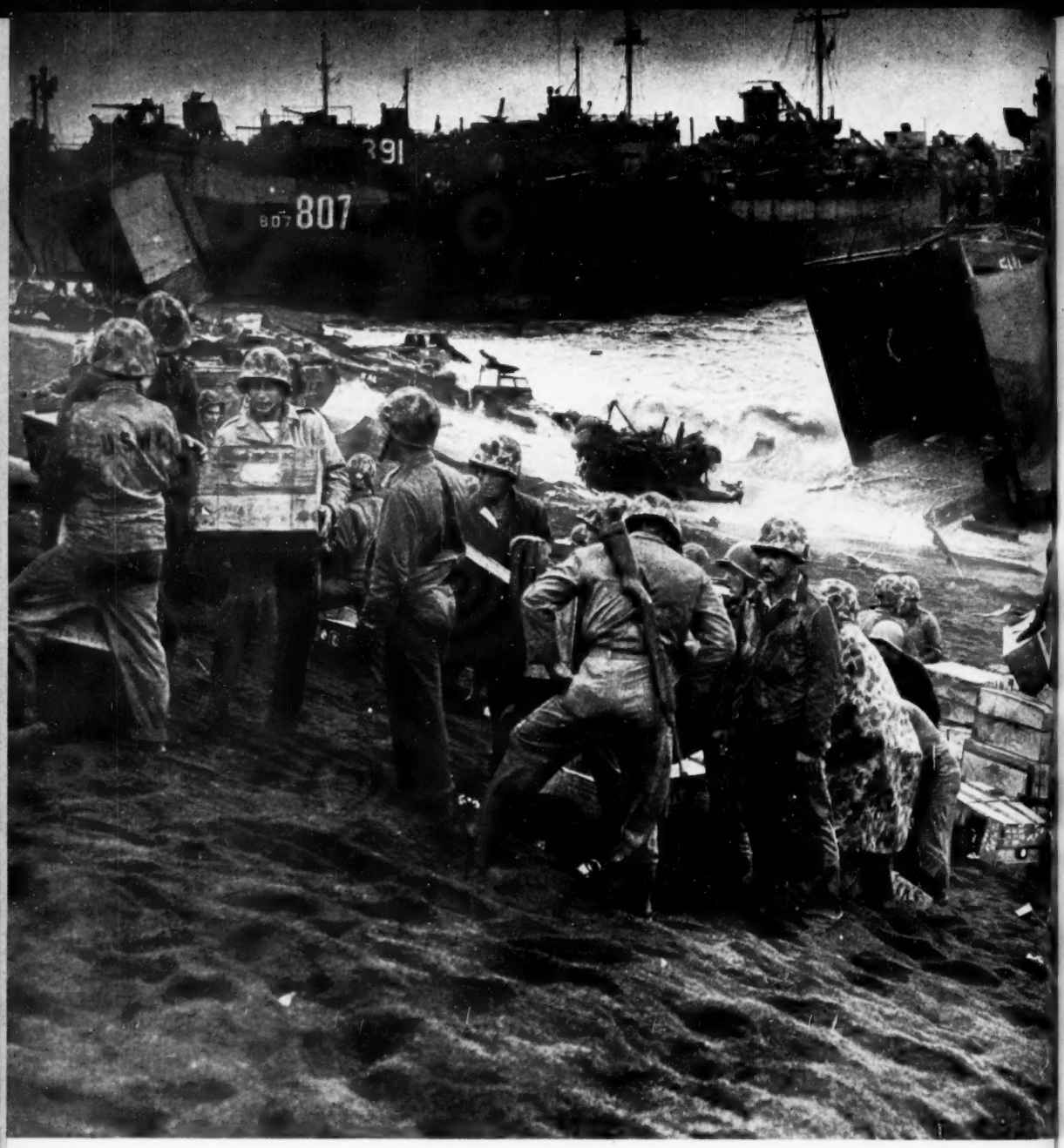


CINCPAC COMMUNIQUE NO. 264 FEBRUARY 19, 1945

United States Marines supported by heavy units of the U. S. Pacific Fleet and by shore based and carrier aircraft have landed on Iwo Island in the Volcano Islands.

The landings were made by the Fifth Amphibious Corps which includes the Fourth and Fifth Marine Divisions after heavy bombardment by battleships, cruisers and lighter units of the Pacific Fleet and sustained bombing by substantial forces of Navy carrier aircraft and also by Army bombers...

From CINCPAC COMMUNIQUE NO. 270, FEBRUARY 22, 1945— Elements of the Third Marine Division began landing on the island in support of the Fourth and Fifth Divisions on February 21.

First Six Days on Iwo Jima

In taking Iwo Jima the Marines had to fight a powerful Japanese garrison which had converted naturally strong terrain into a position that the Japs considered impregnable. *By an Observer*

This article is one of four accounts of the battle for Iwo Jima presented in this issue of the GAZETTE. *All four articles were written while the struggle for the island was continuing, and are therefore not intended as complete, detailed accounts of the action. They do, however, present an interesting composite of the part played in the taking of Iwo Jima by infantry, tanks, artillery, and aviation. The author of "First Six Days on Iwo Jima" was recalled to Washington on D plus 5, and his account ends at that point. The other three articles were written at Iwo during the course of the battle. More detailed descriptions of this important operation will be presented in subsequent issues of the* GAZETTE.

IWO JIMA is just another one of the many islands of Micronesia, unheard of before this war, and, except for its location on the road to Tokyo, completely unimportant. But it possesses sufficient fairly level ground to provide a couple of strategically located airfields, a thorn in the side of the Marianas-based B-29 squadrons as long as it remained in Japanese hands. Under our control, it would become an advanced base for interception, and an emergency field for any B-29 limping back from the Tokyo area. It is now the most expensive and probably the sorriest piece of real estate in the Pacific.

Located in the southernmost group of the Nanpo Shoto, or Southern Islands, Iwo Jima is 660 nautical miles south of Tokyo, and 625 miles north of Saipan. It is sometimes called Volcano Island or Sulphur Island, though most maps do not even condescend to show it as a dot, let alone honor it with mention by name. Nearby are two other islands, Kita-iwo-jima and Minami-iwo-jima, the three forming the Kazan Retto or Sulphur Islands group. Farallon de Pajaros, northernmost of the Marianas, is 335 miles south, and 140 miles north is Chichi Jima, main island of the Bonin group.

Physical Characteristics

Iwo Jima itself is a pear-shaped island, approximately five miles long and two and a half miles wide, with the neck of the pear to the southwest. The main body consists of an almost flat-topped volcanic dome, Moto Yama, about 360 feet high. Except to the southwest, where a narrow neck of low land connects it to Suribachi Yama, it is completely surrounded by wave-cut terraces.

These terraces terminate abruptly in cliffs, but there is another series of inland terraces above the cliffs, which give the island the usual flat-topped appearance of an island formed by raised coral reefs. Apparently there has been a recent general elevation of the area, and according to some reports the island is now rising approximately a foot a year.

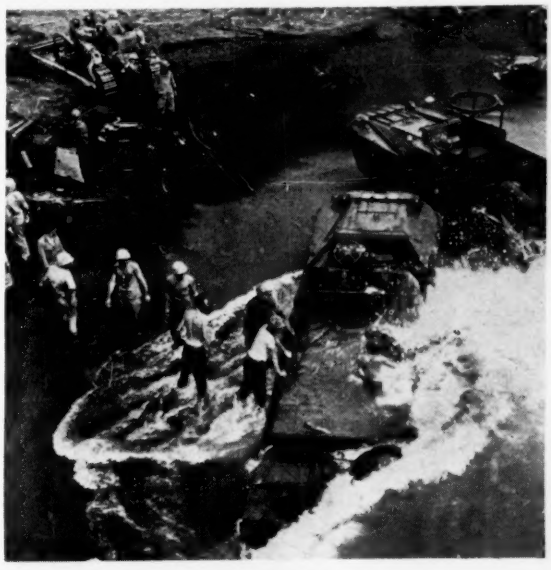
Suribachi Yama, the southwestern end of the island, is an inactive volcano, very steep-sided, and topped by a funnel-shaped crater. Apparently the same wave action which formed the cliffs around Moto Yama also eroded the softer covering of Suribachi and left only the hard central core. Point Hotrocks, the summit, is about 550 feet. (Two figures given—554 and 546.)

The connecting lowland, called Chidoriga Hara, is composed mainly of volcanic sand. It is bordered on both sides by beaches, the only available landing places.

Some traces of volcanic activity still remain. There are about 20 vents or fissures, some of which still emit steam and sulphurous vapor. Off the northeast coast there is reported an active submarine volcano.

The island has only scrub growth, no trees of any size, and is without permanent water.

The Japanese had developed two airfields on



The heavy, grinding surf at Iwo provided still another hazard for landing parties.

Iwo, and were working on a third. The island was evidently a staging point for flights to the Marianas and Carolinas. After the fall of the Marianas, Iwo became the major outpost for defense of the Empire in that area, and was accordingly strongly fortified. Coast defense, antiaircraft, and mobile artillery were integrated into a defensive system thoroughly covering the island. The naturally strong terrain features were well used, and augmented by blockhouses and pillboxes covering the possible landing beaches. The final result was an exceptionally strong position, and one impossible to outflank. A balanced force of from 13,000 to 14,000 troops, both Army and Navy, made up the garrison.

It was estimated that the Japs would man prepared defenses with approximately half their infantry, and maintain the remainder as a centrally located mobile reserve.

Our scheme of attack was to land with two divisions abreast, cross the narrow part of the island, then swing one regiment to the south to isolate Suribachi and reduce it, while the remainder pivoted on the right flank, then swept northeast to clear the island.

We Begin the Softening Up

After the fall of Saipan it was evident that Iwo would eventually have to be dealt with. Occasional raids on the Marianas were made from there, and in exchange our forces occasionally bombed the strips on Iwo. Naval bombardments by cruisers and destroyers on December 24 and 27 and again on January 24 destroyed planes and did superficial damage to installations near the airfield, but did no appreciable damage to the ground defenses.

Beginning in early December, the air forces in the Marianas made daily runs on the island, dropping a total of over 5000 tons of bombs in seventy consecutive days. Photo reconnaissance at the end of this period showed more ground defenses than at the beginning.

Apparently the Nips were just letting our bombs dig the holes, then they finished converting them to pillboxes. Air forces reported consistently heavy and accurate flak, a good indication of the resistance to be faced by the landing force.

The Naval Bombardment

On February 16, 1945, preliminary bombardment and minesweeping began. Participating were several of the old battleships, veterans of Pearl Harbor, and now repaying another installment. Poor visibility hampered the naval gunfire to a slight extent, but the minesweeping was successfully completed. The scheduled strike by land-based air was called off on account of weather.

The day before carrier-based air had hit Chicka and Haha in the Bonins, and this day the famous Task Force 58 hit the Tokyo area.

This 155-howitzer helps pave the way for the drive on the north of Iwo Jima.

Artillery on Iwo

By S/Sgt. Allen Sommers*

In the first 20 days of fighting on Iwo Jima, the 5th Marine Division's field artillery regiment, the 13th Marines, poured 103,776 shells into Jap positions.

The record shows that the 13th Marines' guns were the only ones landed on Iwo Jima on D-day before late afternoon, coming in under conditions considered unsuitable for artillery. "G" Battery, 3rd Battalion, registered its first shot at 1410, five minutes after the first 105-mm howitzer had been unloaded. At 1420 the entire battery was firing after registering on a base point on Suribachi.

The 2nd Battalion, 13th Marines, came in less than an hour later under intense Jap fire, moving up to its selected positions on top of the eastern slope. Two of their guns were left helpless on the scorched beach in blasted amphibious trucks (DUKWs).

The 75-mm Pack Howitzer 1st Battalion started in later in the afternoon, two of its three batteries setting up after dusk under a hail of Jap mortars. The 4th Battalion moved

*Marine Corps Combat Correspondent.

February 17 was bright and clear, and naval bombardment got down to the serious business of destroying Jap installations. Major attention was, of course, given to coast defense guns, and all those located were destroyed or silenced. As the guns were silenced the ships closed in for more accurate work, and were able to do better. Rocket gunboats closed to extremely short ranges, drawing fire from dual purpose and small automatic weapons. The Japs evidently thought this was a landing attempt, and that night Radio Tokyo broadcast the news that a landing had been repulsed.

This day the air strike came in full force, and literally plastered their target area from relatively low altitude. However, and the air experts might bear this in mind, photo interpreters found very little actual damage to installations.

Carrier planes made intermittent strikes throughout the three days of bombardment, paying particular attention to AA guns and defiladed emplacements.

The following day battleships and destroyers stood in to within 1800 yards of the beach and curried the whole area, destroying practically every visible installation. The Nips would restore some of it during the night, and much of the remainder of the island had been barely scratched, but the ships had done the best they could to pave the way. The foot troops always have to finish the job.

On February 19 the transports carrying the assault troops arrived in the transport area. Ships seemed to cover the whole ocean, from horizon to horizon. If the Japs had mistaken our group of LCIs for the landing force, what a shock this force must have been. More than 800 ships were involved.

The Attack

Pre-H-hour bombardment started with first light and continued to H-hour, at times blanketing the whole landing beach with smoke and dust. Three separate carrier air strikes and one land-based air strike added to the drenching the Nips were receiving.

The weather was clear and the sea calm, a perfect day for a landing. By 0730 the LSTs carrying the first waves were in position and started discharging their LVTs. Waves formed and crossed the line of departure as if on a well-organized rehearsal. As the first wave approached the beach the naval gunfire lifted to the rear areas and continued to blanket Mt. Suribachi and the rough ground to the right of the beach.

The actual landing was not opposed, but resistance developed in about 15 minutes. The Fourth Division reported heavy resistance, the Fifth Division moderate. On both fronts it consisted mostly of mortar and artillery fire, the naval and air bombardment having apparently neutralized the Jap infantry. Biggest obstacle was not the enemy, but the

its guns in, but didn't fire until the next day.

The night of D-day the 13th Marines gave direct support to the hard-slugging infantry.

Towards Suribachi Yama the 3rd Battalion howitzers poured shell after shell. On the northern front, our 1st and 2nd Battalions threw their weight. Then came the expected — and feared — counterattack. At 0245 the 27th Marines reported that a full battalion of Jap infantry was moving towards its lines. The 1600-pound howitzers of the 1st Battalion took a few seconds to get a bead on the 250-yard front, and then every piece in the outfit burst into angry flames.

According to Lt. Colonel John S. Oldfield, battalion commander, his howitzers fired 1500 rounds of ammunition in one hour and 50 minutes. The 2nd Battalion, under Major Carl W. Hjerpe, supported its sister battalion with more than 600 rounds of 105-mm ammunition. The first large-scale Jap counterattack of this bloody campaign was stopped dead by the howitzers of the 13th Marines.

On the second day, when Jap fire grew more intense and accurate, Colonel Waller brought the full power of his weapons to bear. Despite loss in officers, men, and materiel, the 13th was in full swing.

On the fifth day of the battle, after Suribachi Yama was secured, the 3rd Battalion, under Lt. Colonel Henry T. Waller, turned its strength to the north.

Using forward observers and aerial observers to spot targets, Jap guns, mortars, fuel and ammunition dumps, pillboxes, caves, machineguns, vehicles, rocket launchers, and counterattacks were destroyed almost daily.

But, even in their "rear" positions the artillery wasn't safe. Up until the twentieth night of the battle Jap fire fell in the 13th Marines' positions. Fire direction centers, set up in blockhouses or other evacuated shelters, continued to direct the firing of howitzers at all hours of the night and day.

Casualties for this Marine field artillery unit were moderate, considering exposed conditions and congestion. Twelve per cent of the officers were either killed or wounded, with 7 per cent of the enlisted personnel on the casualty lists up to the twentieth day. Fourteen of the 24 trained forward observers, the eyes of the artillery, were incapacitated.

The 13th Marines replaced all their weapons destroyed by enemy fire, keeping up to full strength to help other artillery units pave the way for the infantry. At any time every howitzer in the 13th could be brought to bear on any one point on the island.

terrain. Steep terraces behind the beach limited the LVTs to a few yards, and the heavy sand bogged all forms of transportation.

By noon the Fourth Division had advanced roughly 400 yards, uphill all the way. Heavy fire from the right flank hindered the movement, and as naval gunfire lifted, the Japs on the ridge came back into action. The 4th Tank Battalion, landing less than two hours after the initial waves, were soon in action and assisting the advance.

By 1800 the front had been advanced almost to Airstrip No. 1 on the left flank, and extending around to the East Boat Basin on the right. Units were tied in, and dug in for the night.

The Fifth Division, against lighter resistance and less steep terrain, advanced more rapidly. By 1220 it had crossed the neck of the island, and by 1555 was across the southern end of the airfield, having advanced a maximum of 1400 yards. The left regiment (28th) had pivoted on its left flank and established a line across the narrowest part of the neck, completely isolating Mt. Suribachi.

Following reorganization it launched an attack toward Mt. Suribachi at 1545. This attack made about 100 yards, then positions were consolidated for the night.

The 5th Tank Battalion, landing closely behind the assault waves, had had better terrain, and by 1800 had been able to place all its tanks ashore.

By dark the 13th Marines had three battalions ashore, with one registered, and with sufficient ammunition for the night. The 14th, with a more restricted area, had one battalion and part of another ashore.

The situation could have been better, but considering the resistance it wasn't too bad. Air and naval gunfire support throughout the day had been excellent. Casualties had been moderate to heavy. Biggest problem appeared that of getting supplies off the beach.

The bleak terrain of the volcanic island was pitted with caves dug by the enemy.

The Nips Counterattack

Everyone got set for an early morning counterattack. Support ships and planes furnished illumination. The ships fired harassing fire, and were ready to blanket any counterattacks.

Shortly before midnight the Japs attempted an infiltration by landing barge in the Fifth Division area. This was quickly repulsed by the 28th Marines, and the barge sunk.

At about 0400 an unknown but small number of Nips counterattacked across No. 1 airstrip, but were repulsed by the Marines, aided by approximately 20,000 rounds from support vessels. As counterattacks go it was rather picayune, and quiet was soon restored.

D plus One Day

A beautiful air strike, naval gunfire, and artillery prepared the way for the attack on D plus 1. Divisions jumped off on schedule, and met the same dogged resistance of the first day. The right flank of the Fourth Division was able to advance only about 200 yards against the strongly entrenched Japs. The left flank made considerably more progress, and by afternoon all of Airfield No. 1 was in our hands. On the western side of the island the Fifth Division had advanced north about 800 yards, to give us a continuous line across the island just north of the airstrip.

On the south the 28th Marines resumed their attack on Mt. Suribachi, across ground literally studded with pillboxes. By the evening of D plus 2 the base of the mountain was reached, but the lines for the night were withdrawn slightly, as the Nips had exhibited an annoying habit of rolling grenades down the sides of the mountain.

The Weather Joins the Nips

The weather, till now almost perfect, shifted in the afternoon, visibility dropped, and a bit of rain fell. Worse, the wind picked up and started kicking up a bad surf. The beach, difficult before, became more congested. Nip artillery, mortar, and machinegun fire also hindered the unloading and cost us several vehicles and a couple of dumps. Air support was making every effort to locate and eliminate enemy batteries, and these were gradually being brought under control.

D plus Two Day

The attack continued to the north at 0810 on D plus 2, preceded by naval gunfire and a big air strike. The night had been relatively quiet, with a couple of small probing counterattacks which were easily repulsed. Advance was slow, being delayed by extensive minefields well covered by machine-gun and artillery fire. By 1300 the 27th Marines, on the left flank, had reached the 0-1 line, and by 1800 the 25th Marines had pushed to the 0-1 line at one point. The 23rd, meeting the heaviest resistance, gained an average of 100 yards for the day, leaving our line sagging in the middle below Airstrip No. 2.

D plus Three Day

Minor counterattacks and infiltrating attempts occurred during the night, and were repulsed. The nearest approach to a serious counterattack occurred at about 0400 when an estimated 800 Nips were spotted on Airstrip No. 2. Prompt use of artillery and naval gunfire broke up this attempt before it became serious.

Apparently in conjunction with this the Japs also tried a counterlanding in the zone of the 26th Marines, but the force, estimated at 200, was wiped out. By 0700 all enemy attempts had been repulsed and the lines were intact.

At 0835 the 21st Marines, now attached to the Fourth Division, passed through the 23rd, and both divisions resumed the attack. The going was just about as rough as it had been the day before, and at night fall the 21st had gained about 250 yards. On the right the 25th had pushed its right flank forward about 150 yards, and on the left the 26th, passing through the 27th, made 350 to 400 yards.

On the Suribachi front, the 28th penetrated around the eastern side and reached the southern tip of the island at 1400. On the western side progress was slower, and it was impossible to reduce the position that day.

Routes up the mountain were reconnoitered, but naval gunfire had destroyed all old trails.

On the supply front, the beach was slowly being improved, but the surf still seriously hindered unloading. LVTs were the only practical method of hauling supplies, and most units had not established dumps, but were hauling direct from the beach. Supplies were sufficient, but no surplus was being built up.

D plus Four Day

The night was generally quiet, with enough enemy swimmers infiltrating along the western beaches to require extensive mopping up. At 0730 the attack continued, with the 24th passing through the 25th on the right and gaining about 350 yards. The 21st, in the center, was able to make only about 100 yards against the toughest resistance yet encountered. This area dominated the zone of the 5th Division and prevented any great advance on the left.

A front line sniper detail digs in for action in an area blasted by shellfire.

The high point of the day, and of the campaign so far, came at 1035 when a forty-man patrol, using scaling ladders, reached the top of Mt. Suribachi and raised the American flag. The word was all over the island and the fleet in a few minutes. Immediately everything looked one hundred per cent better.

However, there was still work to do on Suribachi, and the whole 28th Marines were still cleaning out pillboxes and blockhouses on the sides and in the crater. By 1215 the 1st and 2nd battalions had met surrounding the lip of the crater, and the mountain was ours.

Mopping up, however, continued for several days.

The story of Suribachi is an epic in itself, and can't be given justice here. It is to be hoped that some participant will soon write the story as it should be written.

D plus Five Day

It was becoming increasingly important to advance the center of the line and take Airfield No. 2. This was dominating ground, and as long as it was in enemy hands, we could not further advance the flanks nor use Airstrip No. 1. All operative tanks including those of the 3rd Tank Battalion, recently landed, were used in a determined effort to erase the Jap salient. All available air, naval gunfire, and artillery participated in the preparation, and at 0915, both divisions attacked. The 21st reached the southeast edge of No. 2 Airfield at 1130, erasing most of the bulge. At 1330, after another artillery barrage, all units resumed the attack. Mines and AT guns again took their toll.

Supported by tanks, Marines stage a frontal attack on Jap positions in northern Iwo. Blasts shown in the center are enemy mortar shells meant for the tank.

Tanks on Iwo

By Major John L. Frothingham

In a letter accompanying this article the author says: "This article is composed and sent under the rigors and handicaps here. In keeping with censorship regulations it has been confined to personal experiences. Reference to tactical or strategic movement has been omitted. The use of tankers' language may be garbled, for the author, trained as an artillery officer, is inclined to call companies batteries at the slightest provocation. For this, apologies to all tank officers."

ON IWO JIMA the three companies of our Tank Battalion were free to fight as tanks. The companies were trained to shoot their 75-mm guns in indirect fire, but before we came on this operation we knew enough about terrain and defenses to leave almost all our indirect fire control equipment with the rear echelon. It proved its worth there and artillery using it did a wonderful job.

Before the operation it was decided that liaison of tanks with our infantry units would be quite essential. As we had only one liaison officer listed and carried on the TO, we used for liaison some officers whose customary jobs were not considered essential for the first few days ashore. Some of these officers went ashore with the fifth and sixth waves to relay back to the Battalion HQ information about mine-free routes on the beach.

There was some question as to how our three-company Tank Battalion would land. With all parties semi-satisfied and none completely satisfied, the tanks finally were boated in three Landing Craft Tanks (LCTs) and six Landing Ships Mechanized (LSMs).

* * *

"Able" Company under Captain John "Davey" Jones landed its tanks in the seventh wave and immediately experienced difficulties in getting on and then off the beach. All tanks were landed, but the Company Executive, Lieutenant Hank Morgan, lost his tank in 10 feet of water while trying to get off the beach. Several tanks were hit by mortar and artillery fire while attempting to find a route from the beach up the steep, four to six-foot terraces. However, a good three-fourths of "Able" Company soon was supporting the attack of Colonel T. Mornham's two assault battalions. The reserve battalion of this combat team, under Colonel Robertson, was called in as the attack proceeded inland, and Captain Paul Svoboda came ashore as tank liaison officer. The Tank Battalion CP, with the Bn-3 Lieutenant George Moore in charge, came ashore in the fourteenth wave just before noon. With him came the Bn-2 section under Lieutenant Lou Miller, the Bn-4 section under Captain Bob Barton, and the Medical and Ordnance sections under "Doc" Hill and Warrant Officer Sorenson.

* * *

By this time the enemy had recovered somewhat from the preliminary air and naval bombardment. Their mortar and artillery fire was falling with

regularity on the beach. It was apparent that the two remaining tank companies needed guides and assistance in landing, so the Battalion CP stepped in to fill that bill.

The landing of "Baker" Company was held up too long for "Able" Company to receive much assistance. By the time "Baker" landed, "Abel" had pushed across and severed the island along with Major Antonelli's Second Battalion of the 27th.

That night the Battalion CP was in the unfortunate position of being located adjacent to an artillery battalion and directly behind the 27th Regiment CP. It was under continual mortar and artillery shelling from the enemy. During the night, four men were killed in their holes and as many wounded. Much radio gear and equipment was destroyed.

* * *

The next morning all available tanks jumped off in support of the attack. Company maintenance sections began the back breaking work of repairing disabled tanks under the untiring direction of the maintenance officers, Lieutenants Overski, Smackhammer, and "Dirty" Dalton.

* * *

Only after five or six days of fighting did the entire battalion get together in one area. When they finally met at a rendezvous, their experiences upon comparison proved similar. They had flushed infiltrated snipers from their bivouac areas each morning before the day's work could begin. Tank crewmen became infantrymen so they could "heat a bit of hot Joe," and accounted for 12 snipers in the first six days.

* * *

"Charlie" Company, working with Colonel Liversedge's 28th Marines in the attack on Mt. Suribachi, more or less fought a war of its own, aided by the able work of our liaison officer, Lieutenant "Vic" Ebaugh. The Battalion CP was temporarily knocked out, so that communication with them was very meager. Rumors came back from their zone of action, however, that the caves were so large that Lieutenant "Dusty" Blake had led his platoon in one end of a cave and out of the other end, still firing. "Dusty" has been noncommittal about these rumors, but there is no doubt that the caves were large.

It was in one of the skirmishes as infantry that an attached Naval lieutenant (j.g.) and the battalion's old Master Gunnery Sergeant, with 27 years' service, were killed . . . Colonel "Rip" Collins, when we finally heard his story, reported being annoyed by several pillboxes on D-day. He had shot at but not destroyed them on the first try. When they shot at his tank from the rear as he was leaving, he was forced to return and demolish them, as later reconnaissance on foot showed.

* * *

As the attack progressed to the north, past Airfield Number One, the tanks continued to support the attack in the areas where they were most needed and where the terrain was most operative. These sectors were the ground between the west beach terraces and high ground on the airfield. As the terrain and sectors widened, more tanks were employed on the front, and the work of the maintenance officers kept the number of operating tanks well over 50 per cent in spite of constant damage being done to our vehicles.

When a tank was knocked out beyond repair, it quickly became a "hangar queen." Some confusion resulted when trophy hunting non-tankers got busy, but our repair crews were soon "cut in on the scoop" and began work immediately on hurt tanks. Crews of disabled tanks harassed unit commanders to be allowed to "go up and get our tank." Repair and salvage was carried out as close as 100 yards from the front lines and under small arms and mortar fire. Very few tanks were lost behind enemy lines and those few were destroyed by our own fire after the crews had been evacuated. There were not more than three such instances during the operation.

At this spot leading to the 3rd Division front, Japanese mortars and artillery were registered, and a barrage was laid down when tanks, troops, and supplies moved up.

Beyond Airfield Number One, the enemy began his use of harassing smoke against our tanks. Although it proved annoying and slightly nauseating, it did not impair the fighting or operational efficiency of our crews to any great extent. In fact, we found that rainstorms imposed a more serious limitation on visibility.

When the first stalemate developed, Colonel Collins enlisted the assistance of the third and fourth Tank Battalions and, after a scrap, a breakthrough was made around Airfield Number Two. Three tanks of "Able" Company were knocked out in this push, and we had our first serious casualties when one platoon leader and three men were killed as their tank hit what must have been a huge land mine. The platoon leader had the day before courageously evacuated Lieutenant Stemkowski from a disabled tank.

* * *

Initially the battalion supply problem was almost impossible, but as things became organized the amphibious tractors came to our aid. They worked wonders. Telephone communication was established through the efforts of our "Comm O," Lieutenant John Ostby, with the cooperation of artillery's Major Hank Smart. This proved invaluable on about the fifth day, when artillery fire was brought to bear on key points as the tanks and infantry made a coordinated attack. Much of the intense and accurate AT and artillery fire our people had been receiving was rendered inoperative by this artillery support, and the attack of that morning went according to plan. When this doctrine proved worthy, more and more coordination with the artillery was sought and received. Around Airfield Number Three, where the tanks had to cross a particularly open flat table top, artillery fire covered both our approach and withdrawal.

* * *

As the battle progressed the enemy used more and more mines, and the cooperation of the infantry's attached engineers to clear routes for us was continually sought. Tank people wanted to be in on the fight with the infantry, but it became increasingly annoying when our tanks were destroyed by mines behind the front lines.

Planes played a vital part in the taking of Iwo, and worked closely with ground troops.

Air Support on Iwo

By Corp. B. W. von Wettberg

It was D-day off Iwo Jima. In a matter of minutes it would be H-hour. The assault waves were in boats awaiting word to head into the beaches. Warships were still pounding the island with high explosive projectiles. Overhead planes were scuttling back and forth dropping bombs and firing rockets.

Deep in the superstructure of a transport, the Fourth Marine Division's Air Office was the scene of great activity. In a far corner of the radio-lined room, Lt. Colonel William R. Wendt, Division Air Officer, was carrying on a two-way conversation with our air observer. Beside him a non-com, Sergeant Yancey C. Sims, monitored the Fifth Division's air observer. Another enlisted man, Stf. Sergeant G. M. Torgerson, logged the requests for air support as they came in from the assaulting regiments.

Captain Lyford Hutchins was on watch as filter officer, moving quickly back and forth from position to position, receiving and passing on messages from Operations, and spotting enemy positions and movements of our troops on a large map of Iwo Jima. The rest of the watch audited Naval gunfire circuits, handled outgoing messages to the Chief of Staff and the Commanding General, kept records of requests, and filed various memoranda coming in from the other Division offices aboard ship.

Two facts became quite evident by the end of the second week. First, the war was hard on our Battalion Staff officers. Lieutenant Lou Miller was hit in the foot with a mortar fragment while working liaison with the infantry, and Captain Svoboda, on a similar mission, was hit in the hand by sniper fire while talking into a telephone. Second, every time we moved the Battalion CP we were in for a downpour, and the enemy would replenish his supply of drinking water. Had the Tank Battalion been able to stay put, the enemy would have run out of essential water sooner, but the war had to move and we with it.

* * *

Our final CP location was adjacent to a huge sulphur blowhole studded with numerous caves that soon proved a great hunting place for Japs and souvenirs. At least 50 flags, and numerous other items were flushed out. Higher echelon used a loudspeaker in an attempt to get the human occupants to come out but to no avail. Pfc. Ackley, of H&S company, used his own version of Jap-American conversation when he heard activity while hunting in one of the many caves. The reported and verified conversation of Pfc. Ackley with the hidden Japs ran as follows:

Jap: "O.K.?"

Ackley: "O.K."

Japs (chorus) "O.K."

Ackley (impatiently) "O.K.***O.K.***O.K.!!!"

Pfc. Ackley was more successful than the interpreters. The Japs gave up.

* * *

"Charlie" company rejoined the battalion when the flag had been raised on Suribachi, and was immediately thrown into the scrap to the north. Platoon Sergeant McIntire of this company got his tank bellied up on some rocks forward of our lines. It was inoperative and could not be evacuated, as the Japs immediately began to swarm the tank in spite of protective fire from the other tanks of his platoon. Lieutenant "Dusty" Blake radioed:

"Don't be afraid Mac—open your hatch and drop a grenade on them!"

"But I am afraid, Mr. Blake," replied Mac tersely but evenly. Nevertheless he opened his hatch and dropped several. Then he radioed back:

Over the speaker the Fourth's air observer reported the progress of the assault. The tension in the room grew.

"First wave 300 yards from Red One . . . landing on Red One at 0859. . . . First wave landing on Green One, time 0900 . . ."

The Naval gun fire control officer cut in on his circuit with the order:

"Move fire back 400 yards."

The air observer continued:

"Landings on Yellow Two at 0902. . . . Lead waves, Blue One at 0906 . . ."

A moment later an officer with the First Battalion, Twenty Third Regiment, which hit Yellow One reported:

"Enemy fire from terraces above beaches heavy. Send strafing mission at once."

At 0910 the laconic report came in: "Mission completed."

A few minutes later, a message came in which Captain Hutchins read to all hands. "Our troops are moving inland. At Yellow One they are in 125 yards; 200 yards at Yellow Two and Blue One. They have not negotiated the terraces." It was evident that this was going to be no pushover.

At 0930 this realization was strengthened when the first ambulance boat was dispatched.

At 0955 the 27th Regiment of the Fifth Marine Division was reported by our air observer as crossing the lower edge of Motoyama Airfield Number One. More strikes were called for. More missions were reported completed.

Major General Clifton B. Cates, Commanding General of the Fourth, entered the rooms. Capt. Hutchins alone paid him any attention. The rest were too busy. General Cates leaned against a radio transmitter, wrote out a note on a scratch pad, and handed it to Lt. Col. Wendt. Without looking up the Colonel nodded his head affirmatively and called our observer:

"Two tanks reported bogged down on Yellow Beach One. Report."

You could almost see the plane swing about and pass over the beach area. Back came the reply:

"Only one tank on beach. Appears to be bogged down."

The General said: "Right. Thank you." Smoking his cigarette with nervous puffs, he left the room.

The 25th Regiment, holding the right flank, requested a bombing mission against an enemy point ahead of their lines. They had located a concentration of mechanized equipment and a dump in the vicinity of some wrecked houses. The requested mission was completed. Our air observer swept over and reported.

On patrol our air observer noted enemy fire coming from several areas on the north end of the island. His reports were logged and turned over to the scheduling officer who decided which point to strike. Planes came in from station on assignment and hit enemy strong points. More positions were found, more strikes made. Minutes passed into hours. Lt. Col. Wendt drank coffee and ate sandwiches but stayed at his post. The others stayed, too, until time for the new watch.

"He shouldn't bother us now. I blew the S.O.B.'s head off."

This sufficiently cleared the area of forces of the Imperial Army to enable Mac and his crew to abandon the tank in reasonable safety. Mac then bothered his CO, Lieutenant "Swede" Nelson, continually until he and his crew were permitted to salvage the tank.

* * *

The infantry liked to have the tanks work with them except when they brought down enemy mortar and artillery fire. Cooperation from our brothers-in-arms was remarkable. To get where they were going, tanks were needed. . . . One bold lad began to lead the platoon of Lieutenant Barker of "Baker" Company over ground that he himself had to climb over on hands and knees.

As operating terrain began to run out in the rocky cliffs in the north tank support became limited to support by fire, with passage up to the front lines limited to dangerous, narrow routes of approach. Trophy hunting came into vogue and the sulphur blowhole and caves got a severe working over by resting members of the company. The early placing of one post of the battalion guard at that spot paid dividends when it was found that many Japs had holed up there. When activity there became annoying we drove a tank to the edge and sealed the openings with well placed rounds of the 75 gun. There were more holes, however, than we had time or ammo to seal in this fashion.

We never blamed our infantry for calling us even when we were unable to get into places where we were needed. They did a magnificent job of cleaning out pockets we couldn't reach without support.

The Three Rs of Invasion

SHIPBOARD schooling of combat teams fighting in the Pacific today has stemmed from the realization that in modern warfare, and particularly in amphibious warfare, a platoon cannot be stronger than its weakest man. Beaches must be seized, consolidated, and the attack continued under a multitude of confusing and hostile circumstances. It is an unfortunate platoon in which the men must look to their officers for information or instruction every time they are confronted with a doubtful situation.

In the past, a colonel once discovered that many of his men did not know the real name of the island they had invaded, believing the code name to be the correct one. Enlisted personnel frequently lived a law unto themselves in battle, without knowledge of their flanks, without a clear idea of their objective, or the enemy capabilities.

Current shipboard briefing practices have changed this situation. As much shipboard time as practicable now is utilized in indoctrinating all personnel with the "three Rs" of invasion: (1) the general plan of the operation; (2) the specific plan for thier division, regiment, battalion, and company, and (3) information about the enemy situation and the target.

In the invasion of Iwo Jima, one landing team schooled its men for a minimum of four hours a day for more than two weeks. Lifeboats and sections of the deck were set off as "classroom." Officers from attached units, such as the tanks and artillery, acted as roving lecturers, and frequent quizzes were given to measure the progress of the men. The use of visual aids was an important part of the program. Not only were maps, overlays, and aerial photographs used, but charts detailing statistical information. Officers used the operations orders and annexes as a "textbook," and passed on every pertinent fact that their men—privates as well as non-coms—might have to know.

Under the first "R," the general plan of the operation, the men were apprised of the overall scheme, preferred and alternate, of the attack, which involved two divisions in assault and one in reserve. They were given complete information on the support they would get from naval gunfire and aerial bombardment. They knew that the Japanese homeland would be under carrier attack before they landed, and that every available heavy and medium land based bomber in the area would "soften up" the island prior to D-day. They knew, down to the last shell, how much naval gunfire would be dumped on the beaches. They saw aerial photographs taken a few days before D-day and flown to their ships at the final staging area.

The second "R," specific plans for their unit, was dealt with in exacting detail. Here are some sample facts: platoons, companies, and battalions that would land on either flank; distance from the beach to the first phase line; direction of attack after the landing; types of communications available to their unit; code names of all officers; meaning of pyrotechnic displays; passwords and countersigns; a list of Japanese phrases (which had to be memorized) useful in combat.

The third "R," the enemy situation, included knowledge of the terrain gained from a study of aerial photographs and relief maps; climatic conditions; number and disposition of enemy troops; type of defense, location of all pillboxes, blockhouses, and trenches observed in their zone of action; probable location of minefields; direction of expected counterattacks; number of enemy tanks on the island; enemy air capabilities.—S/Sgt. David Dempsey.

Jet Propelled Planes

The advance of science and the demands of military aviation have hastened the development of flight by direct reaction, and have given us planes capable of tremendous speed.

By Corporal M. H. Crow

JET propulsion, a type of direct reaction power, has achieved an important place in the field of military aircraft. In the course of experiments with all types of aircraft, engineers have turned, for greater speed, greater power in a single unit, reduced dimensions, and lighter weight, to development of the prime mover which first came to mind when men began to plan to fly. That prime mover is the direct reaction engine, which can be a rocket, a jet, or any type of engine whose operation is based on Newton's third law of motion—that every action has an equal or contrary action. The jet prime mover based on this law uses the power of expanding gases to propel a craft *directly*. It differs thus from a reciprocating gasoline engine which uses such power to drive a piston inside a cylinder, which in turn drives the crankshaft driving the propeller that moves the craft.

Aircraft propelled through the air today by direct reaction represent the first practical realization of one of man's earliest devices for travel by air.

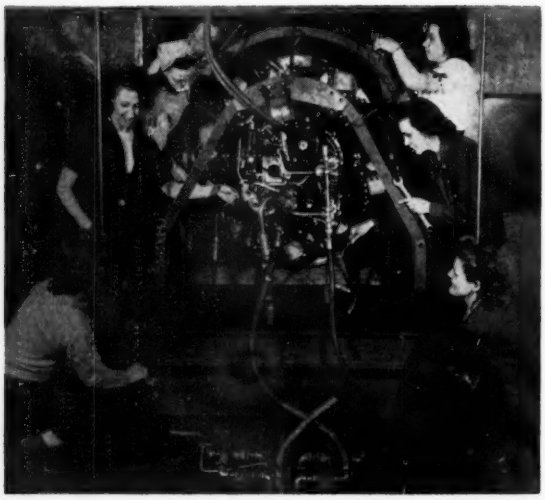
In the middle of the nineteenth century, Englishmen were laughing heartily over an airplane powered by steam reaction which had been designed and patented by Charles Golightly. No definite designs of Golightly's proposed craft have survived the years, but from the patent description it probably would resemble a modern plane in appearance, with a boiler in the fuselage to produce steam which moved the vehicle by direct reaction of a rearward pointing jet.

Lack of any other form of prime mover made the power of the direct reaction rocket and jet intriguing to inventors until the gasoline engine and propeller of the Wright plane made other experiments appear unnecessary. The direct reaction theory of propulsion was relegated to the experimenters and writers of fantasia, but development of scientific knowledge, almost within the past decade, and the demands of military aviation have made it possible to return to this early proposal for flight. The true rocket engine—that is, a prime mover carrying all of its own fuel and not depending upon the atmosphere for any of its impulse—has been used only by the Germans in one type of interceptor-fighter. The jet engine, however, which compresses oxygen in the atmosphere through which it travels with the fuel of its tanks to obtain power, now is accepted as an entirely feasible form of propulsion, and one which is to be the accepted method of propelling several types of military craft.

Emphasis on Jet Fighters

All efforts with respect to jet propulsion are now being directed toward fighter aircraft, because that is where our greatest need lies. After the war, however, jet propulsion is likely to have many applications. It may be used on trains, ships, and in

A Martin Mariner almost jumps from the water at a Pacific base, assisted by JATO, two rocket engines inserted against the fuselage of the seagoing plane.



The P-80 Shooting Star, world's fastest plane, is powered by this G.E. turbo-jet.

small power plants. Its use in automobiles seems unlikely, however, since its highly generative force is not required there.

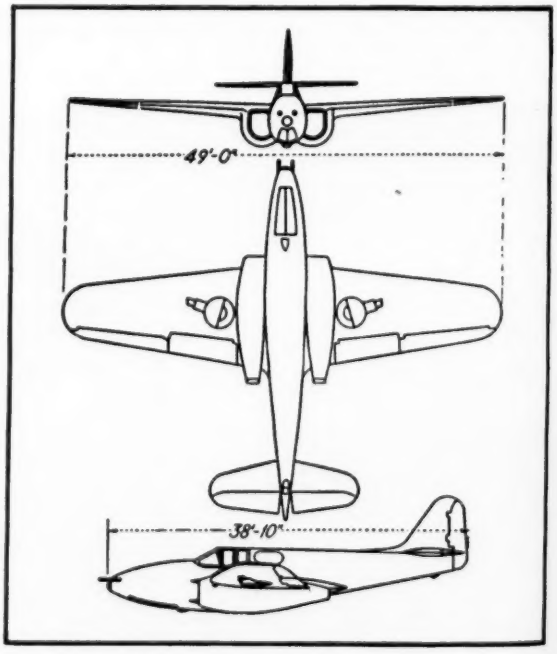
In reviewing what can be said of current jet or rocket propulsion planes, it should be borne in mind that constant work of numerous designers and inventors may make current models or even current theories obsolescent almost overnight. Aviation authorities are maintaining an open mind as to the possibilities of all forms of aircraft, and even the most obscure or bizarre experiments of the past century will come under close scrutiny. It is interesting to know, for instance, that the intermittent duct type of jet propulsion used by the Germans on their V-1 flying bomb is very similar to a type of jet propulsion engine patented in the United States in the early 1930s. The Germans, who have been more willing to place unorthodox engineering techniques into use than have other countries, have found a use for this type of jet propulsion engine, although it is impracticable for piloted aircraft in its present stage.

Germany is known to have had four types of jet or rocket propelled planes in the air in the latter part of 1944 and the first part of this year. Three of these planes operate on turbo-jet engines. The fourth is the rocket propelled ME-163, which has no air intake and carries its own oxygen in chemical form.

One of the most revolutionary aircraft that has seen actual use thus far is the ME-163, an interceptor fighter whose weaknesses are indicative of the progress which remains to be made, but whose performance leads aviators to believe that it is one of the military planes of the future. This craft is limited in range, having a powered flight of only about ten minutes. Its period of flight can be extended to about 45 minutes by periods of gliding. It is a peculiarly designed craft, pot bellied and without a tail plane. Instead of elevators, differential ailerons are placed on the back wing. It is small, with a wing span of about 30 feet, and, being simple in structure, probably can be manufactured quickly and cheaply. The ME-163 has been described as easily maneuverable even when it is gliding.

The three turbo-jet planes which Germany has in the air are more conventional in appearance than the ME-163. The ME-262, for instance, is distinguished principally by its low, swept back wing and cigar-shaped fuselage. Both the ME-163 and the ME-262 have afforded tough competition in the air for Allied aircraft. The other two jet turbo airplanes of the Germans are the AR-234 and the HE-280. The AR-234 is a twin-jet plane similar to the ME-262. No information has been released concerning the HE-280.

Effectiveness of these enemy craft stems largely from the design adaptations possible because of their propulsion power. Their speed is substantially in excess of that reached by conventional aircraft in operations. The fact that pilots can operate such craft as the ME-163, reaching speeds which may be over 500-mph, indicates that the Germans have had to study the problems of human reactions at high speeds. The turbo-jet principle has been incorporated in four Allied planes, the USAAF's P-59 Airacomet, the USAAF P-80 Shooting Star, the British Meteor, and one whose name has not been announced. These have brought allied craft into the same speed range as the enemy's. From these beginnings, it is believed, are coming the military planes of the future.



Bell P-59A Airacomet, America's first jet plane, is powered by two Whittle turbines.

Experimenters with true rocket power such as that of the ME-163 have had to overcome two major obstacles. In the first place, it has been difficult to harness the immense power inherent in the true rocket without installing a complicated mechanism that does away with the rocket's primary advantage of simplicity. In the second place, a rocket that travels any distance also requires an immense amount of fuel. The size of the fuel tanks required for a long distance rocket does away to a great extent with its advantages of speed. The rocket propelled German V-2 bomb weighs 12 tons. Only about one ton of its weight is accounted for by the warhead which is its purpose for existence. Practically all of the balance of the weight is required for its propulsion. It can therefore be seen how an ordinary rocket would be deprived of much of its efficiency. And the propelling mechanism of the V-2 is not as ordinary as a Fourth of July rocket. It is a highly developed form of rocket power.

And of course application of high speeds to piloted aircraft also has had to await development of materials capable of withstanding the heat engendered by hot gases against the turbine of a turbo jet and the nozzles of a rocket.

Advantages of Turbo Jet Engines

The problem of the large amounts of fuel required for direct reaction propulsion and for controlling reaction power has been solved with a great degree of success in the turbo jet engine. The turbo jet engine uses oxygen in the air through which it travels to support combustion. The jet planes suck in air as they travel, compress this air, mix it with almost any fuel (kerosene, for instance) and achieve their powering impulse. A turbo jet engine, as developed today, needs no propeller. The absence of a propeller has accounted for part of the efficiency of jet craft at high speeds. At approximately the speed of sound air compressibility begins to affect aircraft and this effects the propeller and consequently the plane's speed before any other part of the plane is influenced. Some authorities have claimed that elimination of the propeller can increase speed of a plane by at least 100 miles an hour. Other features of modern jet engines, such as their light weight, also serve to increase speed.

There are several types of jet propulsion, but at the present time, the turbo jet engine has proved most efficient for piloted craft. This engine is a development of a British RAF officer, Air Commodore Frank Whittle, who first patented it in 1930. The Germans knew of the Whittle engine in 1939 and undoubtedly have adapted it for use in their jet craft. The engine operates through compression and superheating of air which has been compressed, enriched with fuel, and ignited. This engine effectively employs a turbine to operate the compressor.

The great expansion of the gases so treated provides the propulsion necessary for the plane when it is ejected at great speed through nozzles.

Only 11 bolts hold powerful jet engine to the P-59A, simplifying maintenance work.

Illustrative of the rapid progress being made with turbo jet planes is the Army Air Forces' P-80 Shooting Star, now going into volume production after five months of development. General H. H. Arnold has characterized the P-80 as "the fastest fighter in existence." The AAF's first jet propelled plane, the P-59 Airacomet, continues as a trainer.

The General Electric Engine which propels the P-80 produces much more power than the P-59 engine and is inserted in the tail of the plane. The engine is light but possessed of tremendous power. The airplane also is highly maneuverable at its top speed, it is reported.

This P-80 engine operates in the following manner, General Electric reported:

"Air to the jet engine in the P-80 rams into vents in the front of the wings, almost flush against the fuselage. It pours through the vents to the engine, where it is compressed by a swiftly revolving impeller. At extremely high altitudes the air will be as cold at 75 degrees below zero. The air is whipped by the impeller to a combustion chamber, where fuel burns fiercely. This causes the air to expand and increases its velocity. The air and gases then pass through a blazing-hot turbine wheel, which is connected by shaft with the impeller. The blast then passes out the jet exhaust at the rear tip of the plane, giving the drive or forward thrust."

The engine used in the P-59 Airacomet is an earlier refinement of the Whittle turbo jet engine. On the P-59 one of these engines is placed on each side of the fuselage beneath the wings. The P-59 engine operates as follows:

"Air, sometimes as cold as 75 degrees below zero, is picked up by a compressor at the nose of the engine. From the compressor it passes to a chamber, where fuel and air burn, increasing the velocity of the air and gases. The hot air and gases then sweep through a turbine, spinning it at a tre-

mendous tempo. This turbine, in turn, furnishes the power for the compressor. The turbine and the compressor unit are connected by a shaft and they rotate in unison. After swirling through the turbine, the hot air and gases funnel at pressure through a nozzle, or jet, in rear of the engine. The velocity of this air and the gas gives the reactive thrust which drives the plane forward. The gas and hot air pass out of the jet in a steady stream. The thrust power of this stream of hot air and gas actually is controlled by the fuel throttle. When properly regulated, no flame, glow or stream of smoke emerges from the jet nozzle.

Operation of P-59 Engine

"The P-59 engine is started by electricity from batteries in the plane or an outside source. This electricity starts a small motor mounted in front of the compressor. The motor spins the compressor, which forces air into the combusion chamber, etc. The mixture of air and fuel is ignited and burned. Expanding gases reach a velocity high enough to turn the turbine faster than the starting motor turns it and so the starting motor automatically cuts off and the turbine continues the job of running the compressor."

The Whittle engine of the 1930s was simple, light and efficient. Its application was delayed, however, because it was at that time ahead of other developments. The extreme heat engendered in the engine made it necessary to employ an unusual heat resistant treatment for metals in the moving parts of the turbine. Also, demands of military aviation did not then require the type of performance possible with an engine of this type—a performance unobtainable in a propeller-driven plane.

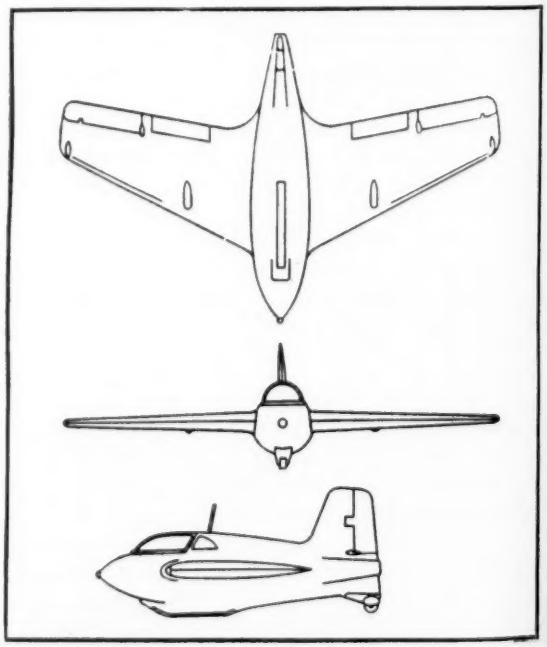
The British placed their first turbo jet plane in the air in May, 1941. But before this plane, the predecessor of the present Gloster Meteor, took to the air, other experiments had been made to incorporate the benefits of reaction power in airplane engines and at the same time overcome their handicaps. It is interesting to review some of these attempts.

One type of jet engine proposed was the thrust augmenter. This power plant was originally the idea of a French engineer, O. Morize. He employed an engine-driven compressor, fuel injection pumps, and combusion chamber with exhaust nozzle surrounded by a series of venturi nozzles to add large amounts of outer air. Another French inventor applied this principle by placing two cylinders end to end, with fuel inlet ports and spark plugs at each end. A piston inside the cylinders provided compression and the exhaust gases were led to a common chamber to which the exhaust nozzle was attached.

In 1929 an American, Dr. Robert H. Goddard, patented a combination turbine and rocket engine which proposed the insertion of two turbine wheels, with propellers mounted inside, into the rocket blast for the takeoff and for flight in the dense atmosphere of low altitudes. When high speeds and altitude were obtained, rockets were to act directly.

Another version of the direct reaction engine was patented in Germany in 1930 by Wilhelm Goldau. This engine was to consist of large torpedo shaped reaction chambers which worked in pairs and had valves at either end. The front valve was opened at the beginning of each cycle, permitting air to enter. In the chamber, the air was sprayed with benzene, fuel ignited, and the exhaust valve opened. Although the chamber in which this power was manufactured was large, it could be light due to the fact that no great pressure was manufactured in the chamber and air flowed continuously through the chamber to displace gases.

None of these craft ever reached the actual flight stage. It remained for the Italians in August, 1940, to place the first jet engine in the air. This was the Caproni-Campini craft of which two different models were manufactured before World War II. The first model had a propeller for the takeoff and changed to jet power in mid air. The second model dispensed with the propeller. The C.C.-2 was a low wing monoplane and in a flight of 168 miles reached a speed of 130 mph. The plane probably had to stop for refueling in this short flight. It had a complicated power plant consisting of a blower driven by a radial engine which sucked air through the open nose of the fuselage. The air was condensed, fuel was injected, and ignited. The exhaust consisted of the combustion products plus the exhaust from the radial engine. Weaknesses of the Caproni-Campini craft are self-evident. The engine



Messerschmitt Me-163B, powered by rocket propulsion unit giving 10 minutes' flight.

was complicated, its flight range was short, use of this power plant did not provide enough speed increase to make it more valuable than a conventional engine.

Complete details of the design and performance of the P-80 have not been released. The plane has been called a match for or superior to the Germans' rocket propelled ME-163. It travels at tremendous speed, and is maneuverable to a high degree at super speeds. No warming-up period is necessary. Thirty seconds after it starts operating, the jet engine will generate enough power to propel a plane swiftly along a runway. At extremely high altitudes, the P-80's G-E Jet functions powerfully and smoothly, and uses much less fuel at high altitude than it does going at the same speed at low altitude. The jet engine is far lighter than reciprocating engines of comparative power, enabling the plane to carry more fuel or bomb and ammunition loads than other types of fighter aircraft of the same power. The engine's simplicity of design and operation also makes it incredibly easy to keep in maximum operating condition.

P-80 Has Superior Range

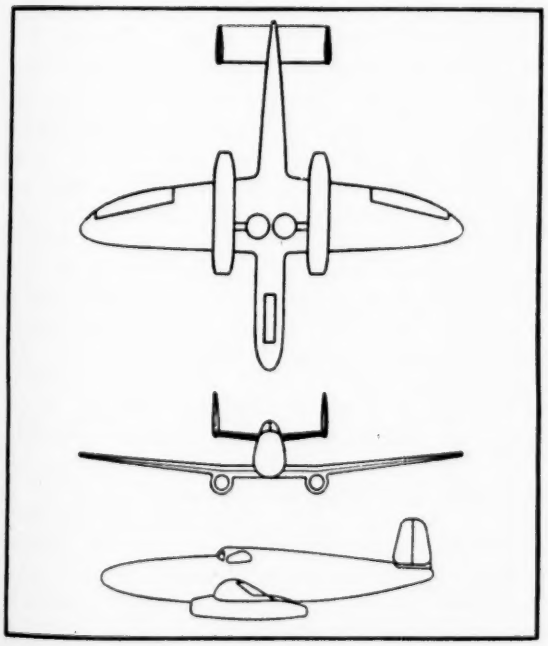
Reports state that the P-80 has a range much greater than that of other jet craft, and equal to that of the customary standard pursuit ships. The plane has a new type of wing with a knife-like leading edge employing aerodynamic innovations that prepare the craft for its great speed. There undoubtedly are other innovations, such as a pressurized cabin equipped for "G" suits designed to combat pilot blackout during strenuous maneuvers.

Despite its high efficiency, and despite the claims and surmises of some aviation authorities, the P-80 Shooting Star cannot be said to have reached the speed of sound. Sonic speed varies with altitude, of course, and sonic speed at sea level is about 700 mph. It is not thought that even the German ME-163 has approached this speed. Before sonic speed is reached or passed, the problems of human reaction at such speeds will have to be more thoroughly solved than at present. The problems of heat-resistant materials also will need further solution.

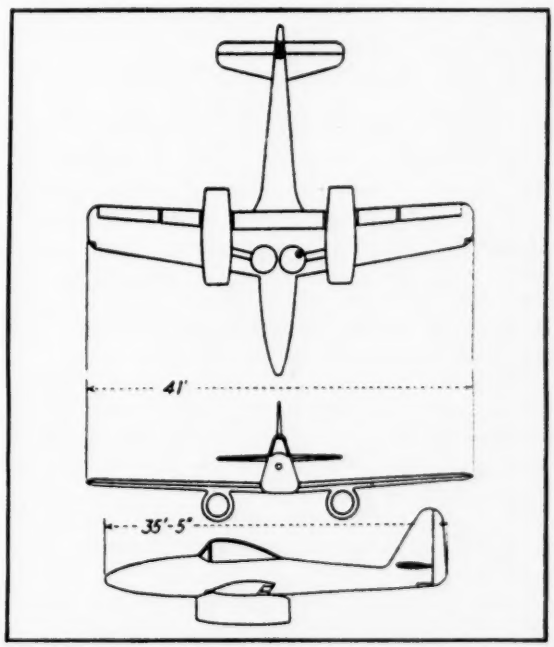
Under the impetus of wartime necessity, these speed potentialities might be reached. Military competition may make them necessary and therefore every effort will be made to make them possible. Peacetime competition may likewise make jet propelled craft at sonic speeds a necessity.

The influence which the efficiencies and limitations of jet engines may have on plane design can be somewhat foreseen in comparison of the design of the P-59 Airacomet with a conventional craft such as the Airacobra. Because no propeller is used, the ground clearance needed for propeller craft is not a problem. Therefore, the Airacomet's landing gear is low, with main wheels partly submerged and nose wheel retracted. Absence of the propeller and engine cowling permits greater visibility from the cockpit and greater freedom in the mounting of forward guns. On the Airacomet the cockpit has been mounted further forward than was possible in the Airacobra.

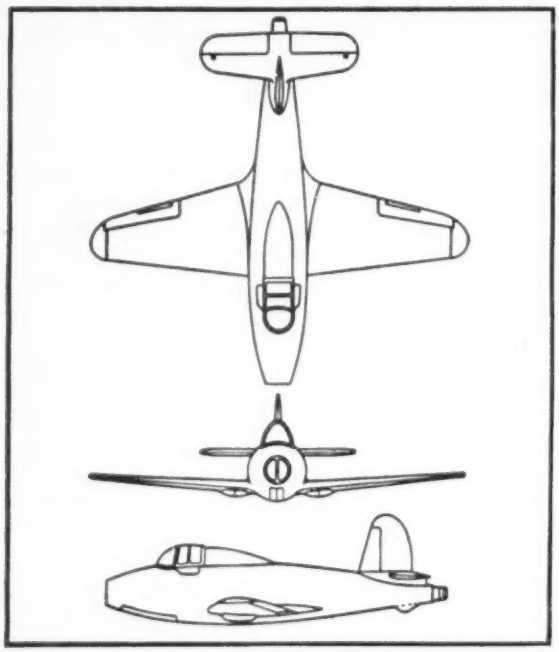
Aircraft engineers believe that differences such as these probably are a foretaste of many changes



Heinkel He-280, single-place jet propelled interceptor, is powered by two gas turbines.



Messerschmitt Me-262, a single-seat interceptor powered by two Jumo gas turbines.



British Gloster Jet Fighter employs one Whittle gas turbine unit in fuselage center.

in plane design which will result from the lightness and simplicity of the jet engine, as well as from its limitations. The undercarriage and tail of the P-59, for instance, has had to be lifted higher in the air to avoid the jet blasts of its twin turbo engines. Pressurized cabins capable of protecting pilots at sonic and super-sonic speeds will be necessary. One proposed device is a supercharged suit, which grips thighs and abdomen tightly and holds up the blood column under high acceleration.

Design of planes also will be influenced by the fact that jet units may be combined with propeller driven units to obtain the maximum benefits of both types. Since the jet propelled plane is inefficient at low speeds because of its high fuel consumption in dense atmosphere, and since it obtains its greatest efficiency in the stratosphere, where it can attain greater speeds than the reciprocating gasoline engine plane, jet units may be incorporated in bombers to assist in take offs and to provide a quick escape after the bomb load is dropped.

Theories also are being studied to incorporate the turbo jet principle with propeller power. A combination such as this also would have its effect upon plane design, as size of the propellers probably could be reduced.

These possibilities, of course, await experimentation and test. The practicality of the present is of more importance in military aviation.

Jet and rocket propulsion already have proved their efficiency in at least one combination of engine types. The Navy has found that its jet-assisted takeoffs (JATO) reduce the normal takeoff runs of planes up to 60 per cent and also allow for an increase in loads. This has been particularly valuable in carrier operations, and for lifting heavily laden flying boats from the water. The units which the Navy uses for this purpose really are rockets rather than jet engines, as the engines contain their own solid propellant and burn without air.

Each one of these JATO units is an engine in itself with an electrically controlled sparkplug that sets it off, and a vent from which the jet gases give their thrust. Any Navy plane can be adapted to accommodate these units, which are placed on the fuselage and can be easily mounted and replaced. The Navy began its experiments with jet and rocket takeoff units in 1941.

Experiments with reversible pitch propellers, which shorten the landing space required for even the heaviest bombers, may result in greatly reducing the limitation on size of aircraft caused by a need for large landing areas. They will also extend the operating range of heavy planes. Development of these methods may enable larger planes to take off from a small space, such as a carrier, with the use of JATO, and land in the same place by employing reversible pitch propellers to brake the engines.

A possibility for the application of rocket power to the problem of launching gliders has been seen by some engineers. Direct rocket power was used successfully in Germany and Italy before the war to give takeoff impulse for motorless planes. Because of its greater complication, jet power has not yet been proven practicable for gliders. However, experiments may eventually result in a simple jet engine being used for gliders taking off from a flat level and for horizontal flight where no gain in altitude is desired.

Jet Propulsion from Exhaust Gas

Experiments also have been made with standard fighter planes which, with special engine exhaust stacks attached, can increase the top speed of a conventional plane 15 mph by use of jet propulsion which obtains extra horsepower from exhaust gas.

Before the war, the National Advisory Committee for Aeronautics made an investigation which resulted in a report that the jet propulsion plane eventually should be from 70 to 80 percent more efficient than any other power system in use, at speeds above those of sound. Because jet propulsion planes now are military weapons the exact nature of their present efficiency cannot be told. But it can be assumed that the NACA report was reasonably correct.

Pilots who have flown jet craft report that they handle more easily than conventional aircraft. Their lack of vibration makes it impossible for the pilot to "sense" how the plane is handling and he must depend on instruments. Lack of vibration, however, abolishes one cause of pilot fatigue. It has even been necessary to install a vibrator on the instrument panel of the P-59 to assure the pilot that

his instruments are not sticking. However, the instrument board is much simpler on a jet plane than on a standard plane. One throttle is used, being worked forward to go, further forward for greater speed, and then back to slow down or stop.

Pilots who are to operate jet craft could be trained in jet planes immediately upon completion of basic training, it is believed. The extent to which training on jet planes is undertaken, of course, will depend upon the extent to which the planes are used.

Aviators who have flown jet craft say they are easily maneuverable, so training of pilots for them should not involve very many complications. The great simplicity of the jet engines cuts down the time required for repair of them. Aircraft repairmen have stated that it requires about one-fifth of the time to overhaul a jet engine that is required for a conventional engine. The P-59 and P-80 require no warming up and when the flight is over the engine is cool enough to be immediately removed for repair.

The extent to which jet propulsion will affect civilian flight will await the end of the war. The extent to which jet propulsion has affected military aviation can be assumed to be great, and will become greater as engineers and designers iron out current problems of such craft and as allied jet craft are brought to action with enemy craft of a like design.

Marine Captain Pioneered in JATO Tactical Use

A NAVY pilot had made a forced landing in his Martin Mariner in a 2,700 foot long, two foot deep lake near El Paso, Texas. The PBM, with its hull resting on the bottom of a lake not long enough for a normal takeoff, seemed solidly stranded. Normal procedure would have been the long and costly job of dismantling the plane and freighting it by flat car to the nearest Naval Aircraft Assembly and Repair shop.

But at noon on June 4, 1944, the day after the forced landing, Marine Captain W. L. Gore warmed the engines thoroughly, gave it full throttle, and headed the 50,000-pound plane into the wind. As the Mariner began slowly to bump forward, scraping on the soft bottom of the lake, twin streams of dense smoke shot out past the tail. The PBM lifted in the water, accelerated rapidly, and took off in approximately 1,800 feet.

Secret of the takeoff was the Navy's JATO. Captain Gore, a pioneer experimenter in jet and rocket units for assisted takeoff, had attached four units to the fuselage of the PBM. Electrically fired, each unit produced 1,000 pounds of thrust for 12 seconds.

This was JATO's first tactical use, although in experiments and demonstrations hundreds of takeoffs had been made with many types of carrier planes and flying boats. Now no longer in the experimental stage, JATO has been accepted for use in combat operations.

In March, 1943, after years of experimentation by United States Engineering Experimental Station at Annapolis, by Captain Gore, and by others, numerous tests were made with units basically the same as those now being produced in quantity for use on carriers and for seaplanes. Naval and civilian experts worked on the development of a liquid type propellant for the units.

"At first," Captain Gore explained, "it was felt the solid type JATO unit could be used only on carrier planes, that it didn't produce sufficient thrust for the bigger boats. We have found since that the solid type can be used on all planes, but in various combinations of number of units and length of time the thrust is produced. At present, the solid type is felt to be superior for use in the Fleet. However, according to present developments, the liquid type is cheaper and may be the form of propellant used commercially after the war."

JATO units attached to seaplanes permit the boats to operate out of restricted areas with maximum loads and also allow rough water takeoffs impossible under normal engine power. Captain Gore believes the widest use of JATO units on seaplanes will be in sea rescue work, for the quick acceleration puts the planes on top of the waves quickly. Attachments on the fuselage permit plane crews to install the units while the plane is on the water. The units can be dropped when the plane is in the air.

Adoption of JATO for tactical use does not mean that experiments have been halted. Technicians still are seeking more efficient propellant mixtures, and also are endeavoring to cut down the amount of white smoke emitted by the units when they are fired.—CAPTAIN ELLIS M. TREFETHEN, Marine Corps Public Relations Officer.

Technique of Control in Close Terrain

How to insure the physical integrity of tactical formations by the intensive training of the individual in stride, compass, and phase lines. *By Major Robert M. Simpson*

At the insistence of Brig. General O. R. Cauldwell, each man in the 3d Marine Regiment was thoroughly trained in the methods of control described in this article. Because of the intensive individual training in these control methods the 3d Marines were able to move against the enemy in the heaviest jungle terrain without losing either direction or control. The author expresses his gratitude to General Cauldwell for his insistence on such training.

THE greatest source of worry and concern of an infantry company commander in close proximity to the enemy is his ability to control and coordinate the movements of the various units which make up his command. Here, outlined briefly, are three simple subjects which must be known and practiced by every individual in the command and without which no leader of troops can assure himself of satisfactory coordination of his troops—unless he adopts the usual expedient of moving his men in one column regardless of the situation or the terrain.

The adaptation of close order and extended order formations to varied terrain and to changing enemy situations has been covered in many field manuals and training publications. However, in none of these are found grouped under one heading simple control procedures to be stressed in training to insure the physical integrity of tactical formations.

Theoretical instruction in the technique of control should be given to each Marine and should be followed immediately by a series of field exercises. This instruction and these exercises should precede fire team, squad, platoon, and company infantry tactics.

Theory of Control and Coordination

The technique of properly controlling and coordinating the forward movement of an infantry company in the approach march depends mainly upon the knowledge and practical application of the three subjects listed as follows: Stride, Compass, Phase Lines (Terrain, Distance, and Time).

(1) STRIDE—A stride is two natural steps or paces and is the usual unit of measure in military sketching on foot. It has a definite bearing on the control of troops in forward or retrograde movements.

The stride of the average individual is approximately 60 inches or five feet. However, the length of the stride will vary with each individual. The individual's stride will shorten when he is going uphill and lengthen when going downhill. Consequently, every Marine should know the average length of his stride so that upon inquiry he could assert that in 100 yards he would take approximately 60 strides or in 300 yards he would take approximately 180 strides.

In determining efficiently the average length of his stride, the individual should walk over good, fair, and poor terrain carrying his combat pack and his individual weapon, so that his stride will be subjected to all types of terrain under a normal combat load.

To find his stride scale, the individual should cover a measured mile in a straight line taking normal

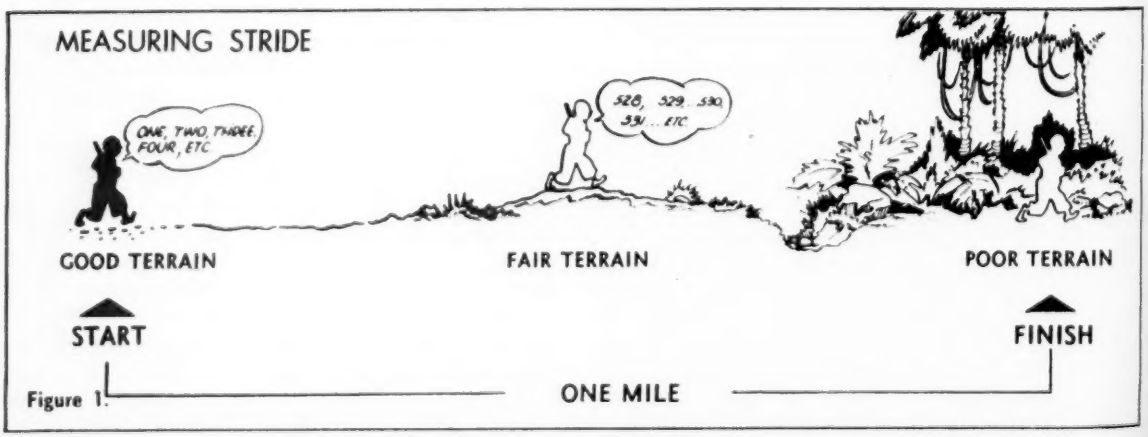


Figure 1.

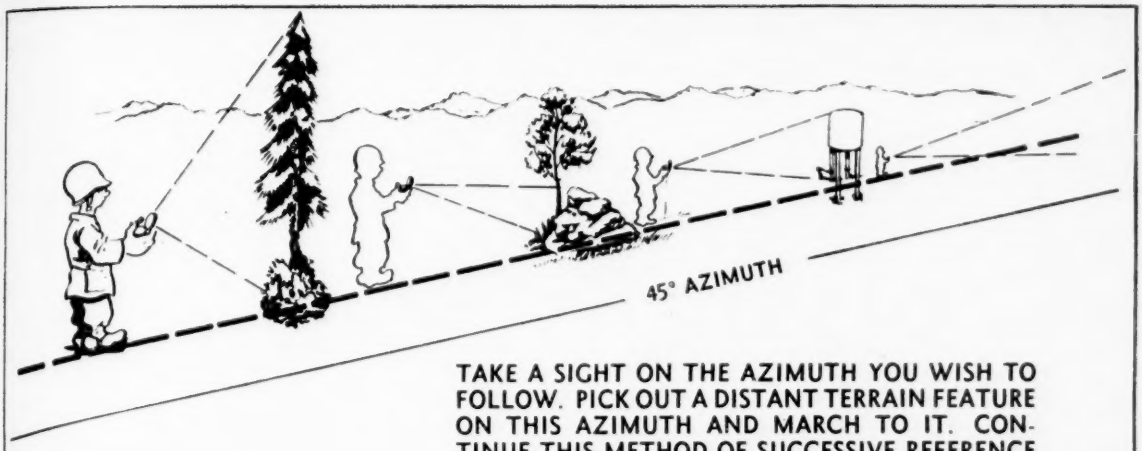

45° AZIMUTH
TAKE A SIGHT ON THE AZIMUTH YOU WISH TO FOLLOW. PICK OUT A DISTANT TERRAIN FEATURE ON THIS AZIMUTH AND MARCH TO IT. CONTINUE THIS METHOD OF SUCCESSIVE REFERENCE POINTS UNTIL YOU REACH YOUR DESTINATION

Figure 2.

steps. He should step off on his left foot and count the number of times his right foot strides the ground until the mile has been covered. The number of strides taken divided into 5,280 (5,280 feet in a mile) will give him the average length of his stride in feet. The individual should return to the starting point over the same terrain. He will discover that the stride count on the return mile will vary only slightly from the count taken during the first mile. See Figure 1.

The individual should repeat this performance at night using another direction and utilizing good, fair, and poor terrain. He will find that over the same varied terrain covering the same measured distance, strides taken at night will be approximately the same number as those taken during the day.

Periodically, during tactical problems or control exercises, each Marine should be ordered to measure the distance covered in the problem by use of his stride, thus causing him to convert his stride into actual yardage—for example, I have taken 180 strides, consequently I have gone 300 yards.

This is the individual's first lesson in confidence. He will discover that he can determine with a surprising degree of accuracy the distance he walks.

(2) Compass—The compass is an instrument for determining direction by means of a magnetized bar or needle which turns freely on the pivot and points to the magnetic north.

The commanding officer should teach his men to believe in the compass. He should emphasize the fact, however, that this instrument is affected by iron and electrical fields, and that compass readings should be taken some distance from attractions such as barbed wire, heavy guns, telegraph wires and high tension lines. It should be stressed that the rifle, pistol and helmet must be laid aside during the compass reading. The commanding officer should emphasize and reemphasize the fact that if these precautionary measures are taken, this instrument will be right invariably.

While it is well for every man in a body of troops to knew all phases of compass work with regard to map reading and related subjects, for the purpose of control, it is necessary that he be familiar only with maintaining exact direction, offsetting and taking back azimuths. The theoretical aspects of directions, offsets and back azimuths are listed below and are divided into two main groups, namely, use of the compass by day and use of the compass by night.

(*a*) *Use of the compass by day.* (To march in a given direction.) This is a simple instruction and involves peering through the lens and turning the body until the required azimuth is read. Then it is necessary only to pick out a terrain feature or reference point in direct line of the sight and march to that terrain feature or reference point. Successive points should be used until the desired destination is reached. It should be stressed that the reference point must be within direct line of the sight, as shown in Figure 2.

(*b*) *Offsets.* It is not unusual when following an azimuth to encounter obstacles such as water barriers, deep depressions or high precipitous cliffs which make it necessary for one following the compass course to detour. To detour one merely takes a 90 degree offset. See Figure 3 on next page.

(*c*) *Back Azimuths.* Frequently, circumstances arise which make it necessary for one following a compass azimuth to return to the starting point. The return journey can be computed accurately by taking a back azimuth which involves adding or substituting 180 degrees to the azimuth originally followed, i.e., 180 degrees should be added to the original azimuth if it is less than 180 degrees, or 180 degrees should be substracted from the original azimuth if it is greater than 180 degrees. This is shown in Figure 4 on the following page.

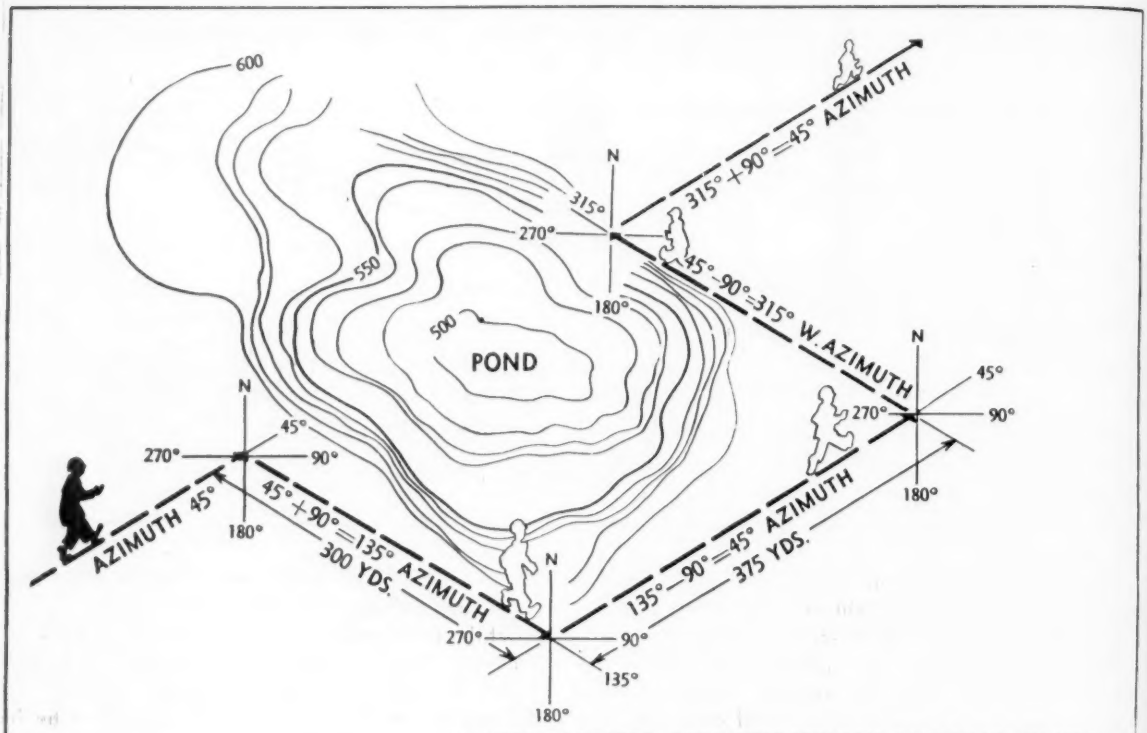


Figure 3.

WATER BARRIERS, DEEP DEPRESSIONS AND HIGH CLIFFS MAKE IT NECESSARY TO TAKE A NINETY DEGREE OFFSET

(*d*) *Use of the compass at night.* A compass with a luminous dial should be used at night. The same procedures are followed by night as by day except that successive reference points and frequent compass readings are necessary. Because of the inability to distinguish objects clearly at night for any great distance, a reference point must be at close range and in constant view. However, if the night is so dark that reference points cannot be used, the individual must rely on his ability to follow the direction indicated on the compass without the assistance of reference points. It is mandatory then that frequent compass readings be taken (every 10 or 20 yards) to make certain that the right course

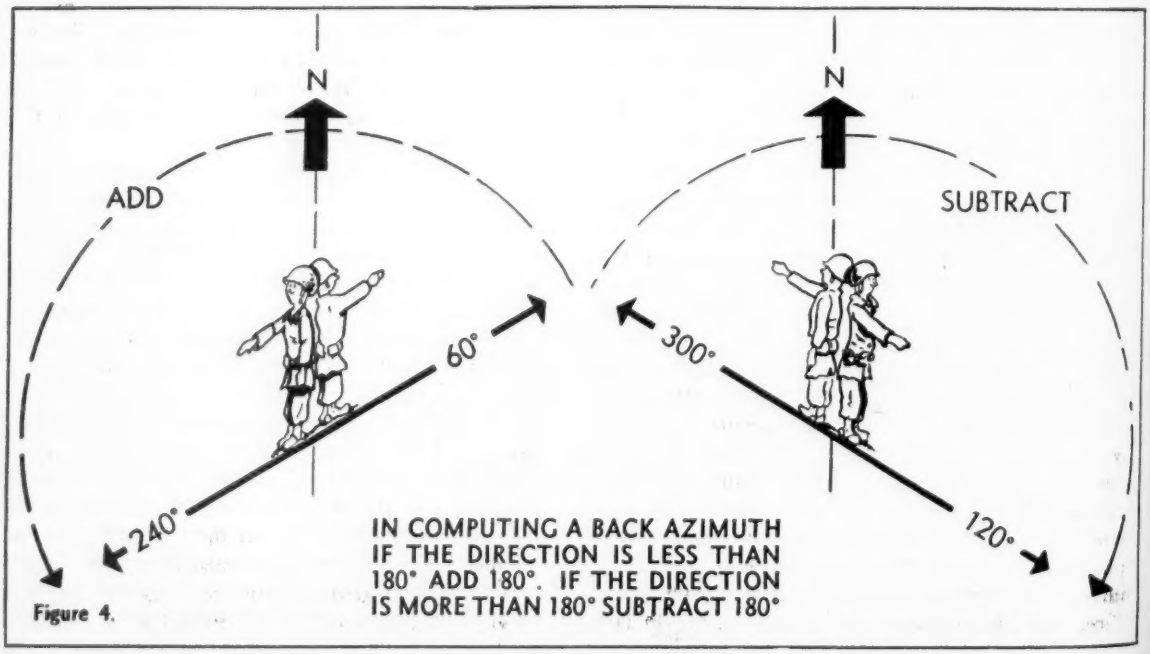


Figure 4.

IN COMPUTING A BACK AZIMUTH IF THE DIRECTION IS LESS THAN 180° ADD 180°. IF THE DIRECTION IS MORE THAN 180° SUBTRACT 180°

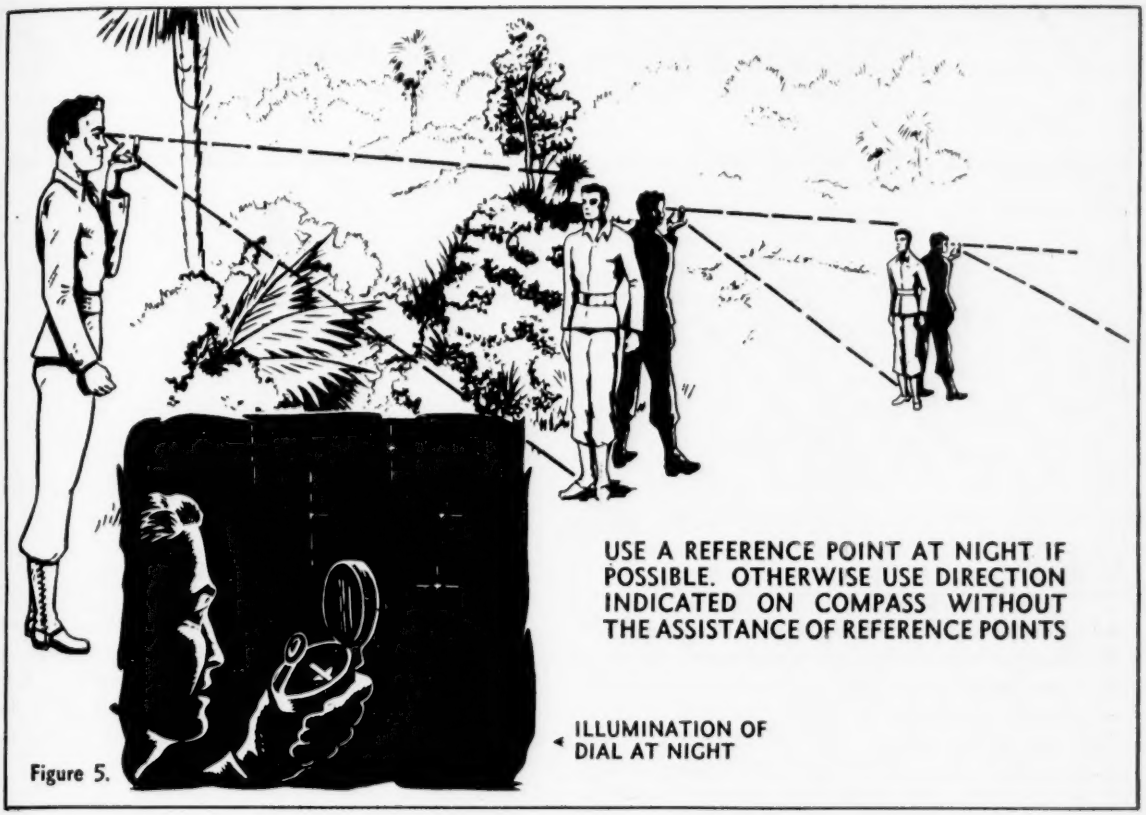

USE A REFERENCE POINT AT NIGHT IF POSSIBLE. OTHERWISE USE DIRECTION INDICATED ON COMPASS WITHOUT THE ASSISTANCE OF REFERENCE POINTS
ILLUMINATION OF DIAL AT NIGHT

Figure 5.

is being followed. This illustrated in Figure 5.

(3) PHASE LINES—A phase line is a conspicuous terrain feature, the terminating point of a specific distance or the end of a time interval, and is used as a place where troops are halted for the purpose of reestablishing contact, coordinating details and issuing further orders. Each phase line is used as a temporary objective in reaching the final objective. Thus, it is seldom that a body of troops in forward movement fails to stop periodically to reorganize, coordinate movements or receive new orders. The three types of phase lines are described briefly in the following paragraphs.

(*a*) *Terrain.* A terrain phase line is a prominent terrain feature, such as a river or high ridge, and is used because it can be pointed out and reached easily by small unit commanders. The terrain phase line is employed principally during daylight as most movements are made by day; however, it may be used at night in open country. The stride scale and the compass are not needed when the terrain feature can be observed continuously during the forward movement.

(*b*) *Distance.* A distance phase line is a predetermined distance at the end of which one unit will seek to make contact with another unit. The distance phase line is used principally in the absence of a prominent terrain feature on which to guide. The absence of a terrain feature is caused by darkness, thick jungle or heavy woods. The distance phase line may be used also when the situation is obscure or when the commanding officer wishes to reestablish contact every few hundred yards. For example, he may want to establish a phase line every 300 yards, in which case the units operating under his command would go that distance, stop, regain contact to the front, the right or the left, and await further orders. The employment of this type of phase line makes it necessary for the individual to know his stride scale to determine the distance traveled and his compass to insure movement in the direction assigned. Figure 6 on the following page illustrates this.

(*c*) *Time.* A time phase line is a previously specified time at the end of which one unit will seek to make contact with another unit. The time phase line is used under the same conditions as the distance phase line, namely, in the absence of a prominent terrain feature caused by darkness, thick jungle or heavy woods, when the situation is obscure or when the commanding officer wishes to regain physical contact at short time intervals in order to give further orders. When the time phase line is utilized, the commanding officer will specify a time at which his command will halt, restablish contact, and await new orders. It is important that when the time phase line has been reached, the commanding officer and his subordinate officers (by use of the stride scale) know the distances they have covered, so that when con-

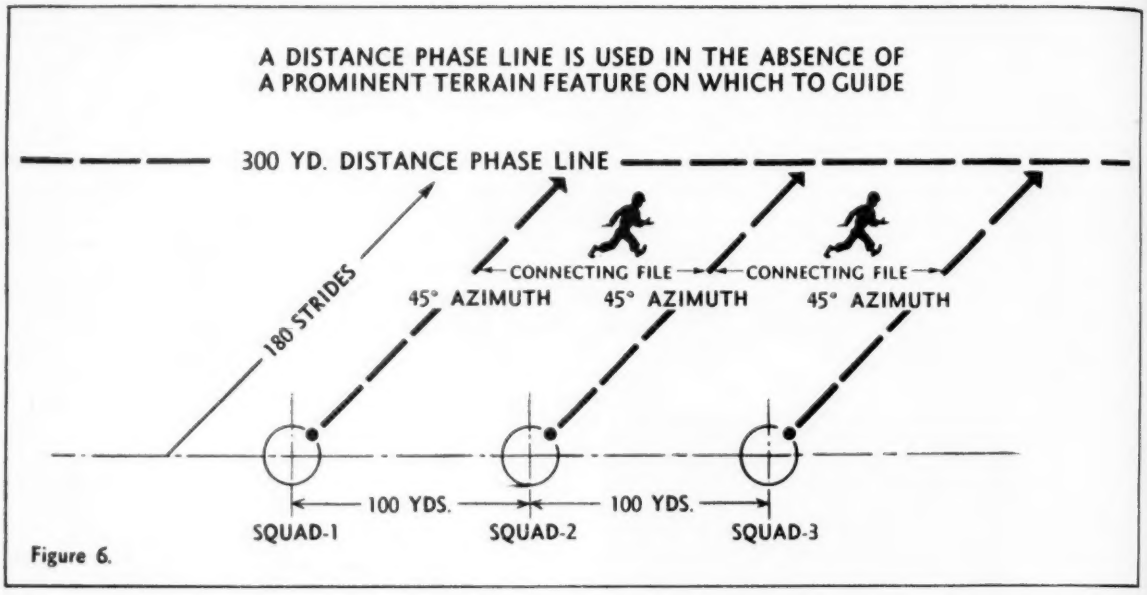


Figure 6.

tact has been reestablished to the front, the right or the left, the relative position of each squad or platoon can be determined. It is essential that the compass be employed to prevent the integral units from closing in on one another and to keep the units in their own zones of advance. Therefore, it is necessary for the individual to know his stride to measure distance and his compass to insure maintenance of direction. See Figure 7.

Unless a commanding officer has horizontal or vertical wire communications with the units under his command, he must use phase lines for reorganization and coordination. A phase line is the clearing house for intelligence and the classroom for new instructions. Proper and intelligent utilization of successive phase lines is one of the greatest factors in the maintenance of high morale because it develops in the troops a feeling of solidarity and confidence in their leaders.

Practical Exercises

Practical exercises utilizing the stride scale, the compass and phase lines must follow the theoretical instruction in order to develop the technique of control and a feeling of solidarity within the unit or units.

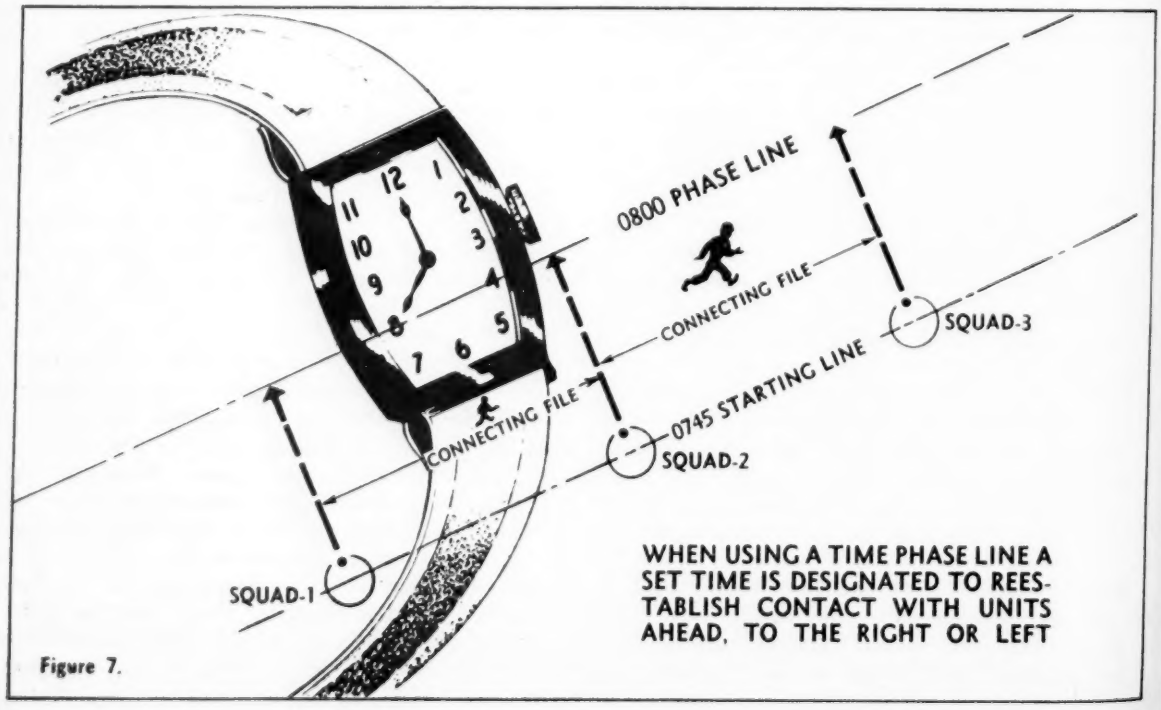

0800 PHASE LINE
CONNECTING FILE
SQUAD-3
0745 STARTING LINE
CONNECTING FILE
SQUAD-2
SQUAD-1
WHEN USING A TIME PHASE LINE A SET TIME IS DESIGNATED TO REESTABLISH CONTACT WITH UNITS AHEAD, TO THE RIGHT OR LEFT

Figure 7.

Control can be attained only through cooperation between the individuals of a unit or between one or more units. Cooperation is defined as "the act of working jointly together for the same end," and the achievement of it demands that each individual carry his share of the responsibility in gaining that end. Consequently, each individual must know his stride scale, the operation of the compass and the proper use of phase lines. By continued practice and application of these facilities for control, the individual will learn the limitations of terrain and how to combat those limitations; will understand more fully coordinated movement; will be more receptive to orders; and will develop complete confidence in his own ability to travel the correct distance in the right direction and to arrive at the right time. The possession of this knowledge and experience by each individual in a unit is essential in maintaining control.

To emphasize the necessity of acquiring the technique of control, form in column of squads, at night, in jungle country or in a heavily wooded area, a platoon of men who have no working knowledge of these three subjects. Place each squad sufficiently in the rear of the preceding one so there will be no visual contact and start the men moving in one direction with instructions to halt at 400 yards and regain contact. Before they have gone 300 or 400 yards, each squad will have veered from the original direction and will find it difficult to regain physical contact at the point of reorganization. Furthermore, each individual will have his own theory as to the direction to be followed, the distance travelled and the point at which to halt. These differences will cause confusion and lack of coordination and cooperation. See Figure 8.

To further emphasize the importance of acquiring the technique of control, form these same men into a line of squad columns in which there is no visual contact between parallel columns and start them moving in one direction with instructions to stop and regain control when they have gone 400 yards. Again, they will find it difficult to regain physical contact at the point of reorganization. This is illustrated in Figure 9, next page.

Following are examples of a few control exercises for the field which will help in the development of cooperation and confidence. These exercises should be held after theoretical instruction, as outlined previously, has been given.

Stride Exercises. Form a platoon in line of squad columns in open terrain so that each column can see the other plainly. Establish the interval between columns at 100 yards. Inform the squad leaders that the squad column will start moving simultaneously in one direction, guiding to the right, and will halt when by everyone's use of the stride scale it has been determined that a 200-yard phase line has been reached. Point out to the squad leaders that the columns will proceed at a normal rate of speed and will maintain by visual contact the 100-yard interval. It will be found that at the end of the 200-yard phase line the columns will be relatively in the same position as they were before the exercise began. See Figure 10.

This stride exercise should be continued until at least 2,000 yards have been covered. Confidence will develop rapidly when the men can see how

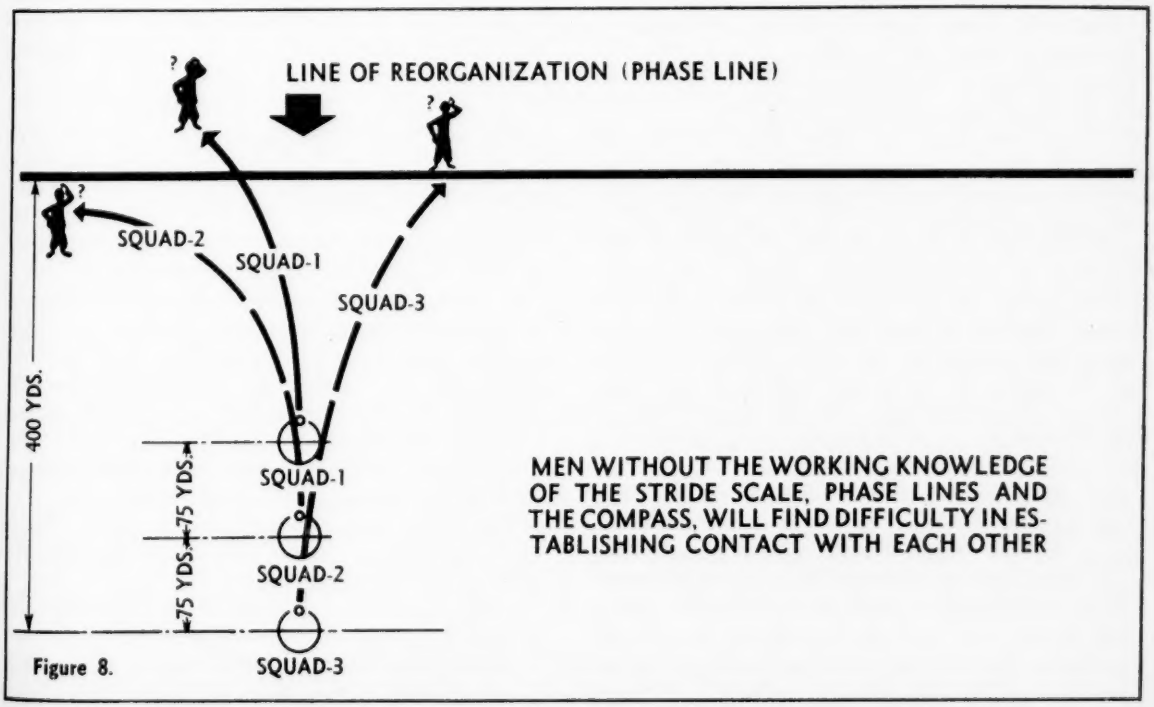


Figure 8.

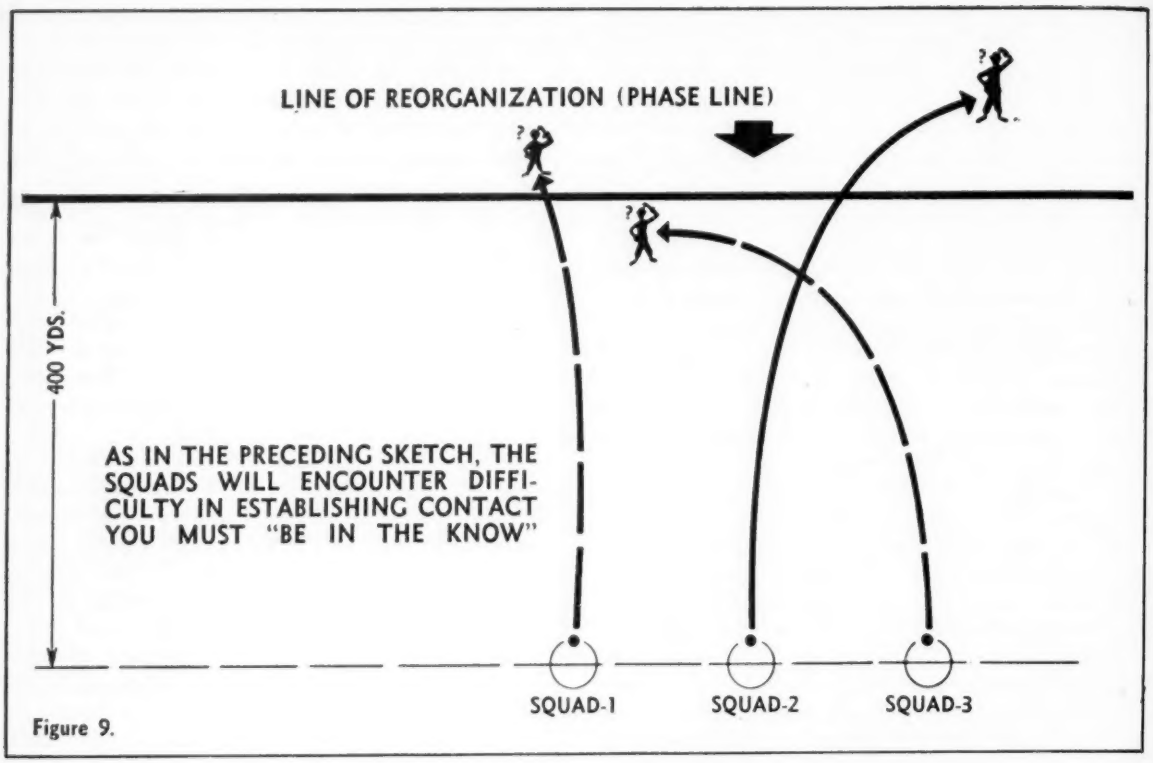

LINE OF REORGANIZATION (PHASE LINE)
400 YDS.
AS IN THE PRECEDING SKETCH, THE SQUADS WILL ENCOUNTER DIFFICULTY IN ESTABLISHING CONTACT YOU MUST "BE IN THE KNOW"
SQUAD-1
SQUAD-2
SQUAD-3

Figure 9.

their strides can be computed into yardage and can observe at the end of the yardage assigned their relative positions with the other columns.

Similar stride exercises can be used for any number of troops or any size unit. It should be stressed in all instances that each individual must compute his own stride scale.

Distance Phase Line Exercises. At night or in heavily wooded terrain form a platoon in line of squad columns so that no column can see or hear the other parallel columns of the platoon. Inform the squad simultaneously on the same azimuth and will halt when a distance of 200 yards has been reached. Point out to the squad leaders that the 200 yards is to be determined by use of the stride scale and that the columns will proceed at a normal rate of speed. When the 200-yard phase line has been reached, the squads will halt and the column on the left will face right and will move out as skirmishers until it has reached the column on its right. When contact has been made, the second column will face right leaving the first column in its place and will move out as skirmishers until it has reached the column on its right. The last column which has been reached in this manner will take its interval to the right out of sight and hearing of the other columns and the platoon exercise will proceed. This exercise should be continued until at least 2,000 yards have been covered. The practice of this exercise will result in group confidence as the troops will be impressed by the fact that the columns will be relatively in the same positions at the end of the exercise as at the beginning.

Similar exercises can be improvised for any number of troops or any size unit. See Figure 11.

Time Phase Line Exercises. At night, in jungle country or in wooded terrain form a platoon in line of squad columns with sufficient distance between columns so that no column can see or hear the other parallel columns of the platoon. Inform the squad leaders that the columns will start moving simultaneously on the same azimuth and will halt and reestablish contact when ten minutes have elapsed. Point out to the squad leaders that the columns will proceed at a normal rate of speed and that at the end of the 10-minute interval the distance covered by each squad will be reported. Synchronize watches and begin the exercise.

It will be found at the end of the 10-minute phase line that the columns will be relatively in the same position and formation except that they will be 200 or 300 yards farther along the axis of approach. Inasmuch as the columns will be relatively in the same position as they were at the beginning of the exercise, it would follow that the distance covered by each column would be relatively the same.

The stride scale in this exercise is used to determine the distance covered and the compass is used for the maintenance of direction.

Similar exercises can be used for any number of troops or any size unit. See Figure 12.

Advanced Exercises. After the individual has demonstrated his proficiency in the use of the com-

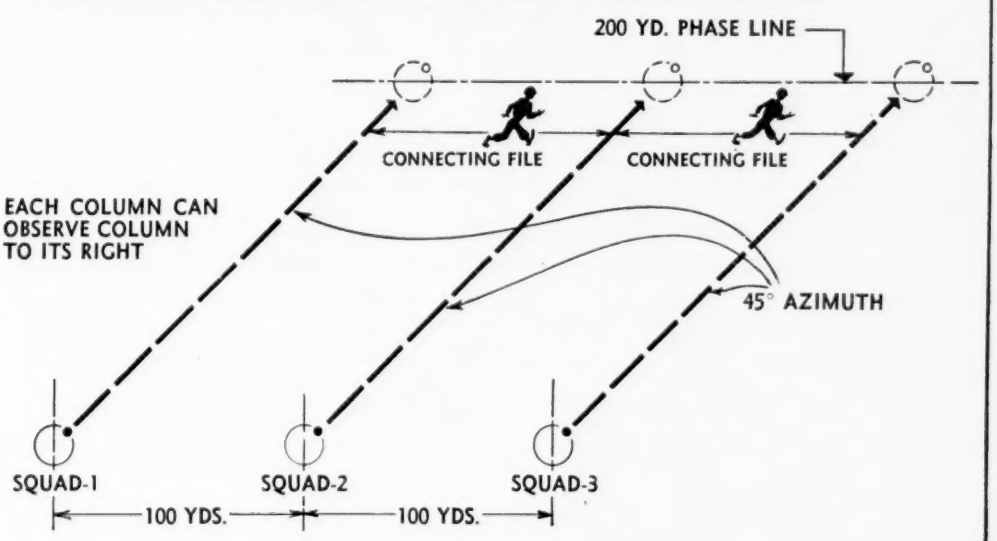

SQUADS 1, 2 AND 3 PROCEED SIMULTANEOUSLY ON THE SAME AZIMUTH OF 45° THEY HALT WHEN THEIR STRIDE SCALE HAS DETERMINED 200 YDS. HAVE BEEN COVERED. SQUADS WILL BE IN THE SAME RELATIVE POSITIONS AS AT THE BEGINNING OF THE EXERCISE
200 YD. PHASE LINE
CONNECTING FILE
CONNECTING FILE
EACH COLUMN CAN OBSERVE COLUMN TO ITS RIGHT
45° AZIMUTH
SQUAD-1
SQUAD-2
SQUAD-3
100 YDS.
100 YDS.

Figure 10.

pass, stride scale, and phase lines and has participated in simple exercises, he should be introduced to the more complicated aspects of the control of larger units in heavy jungle and the part he, as an individual, must play in making it possible for the larger unit commander to maintain control of his unit.

One such exercise is illustrated in Figure 13. In this case, the individual is placed in charge of a fire team or a four-man patrol. It is explained that the company is halted and his fire team has been assigned the responsibility of reestablishing contact with the company on the right, which is believed to be about 500 yards away and echeloned

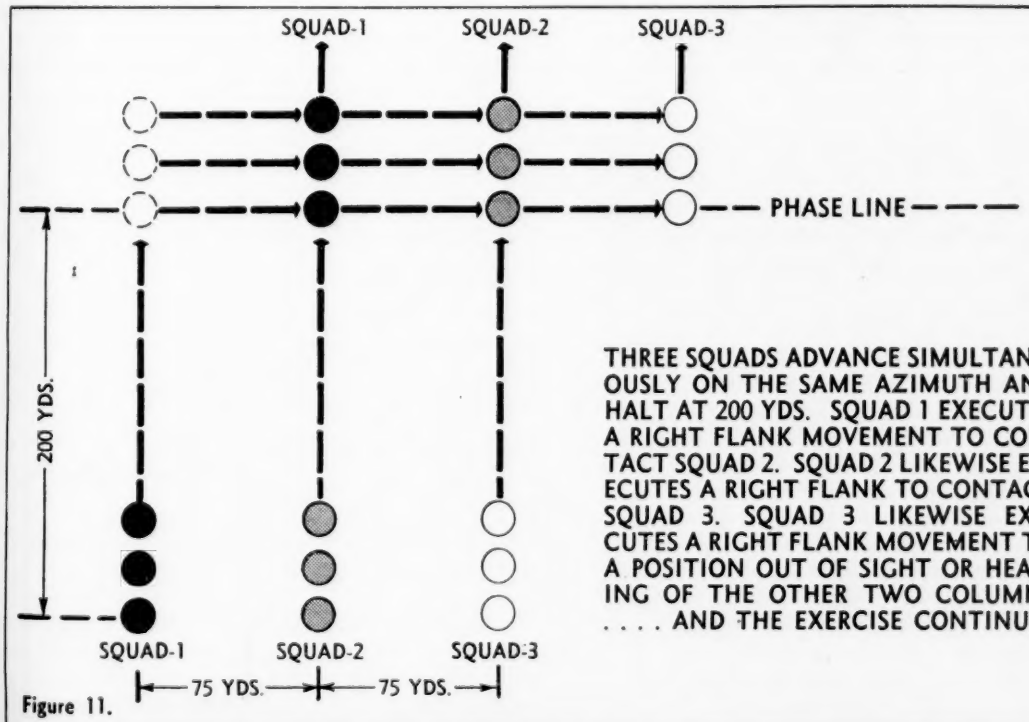
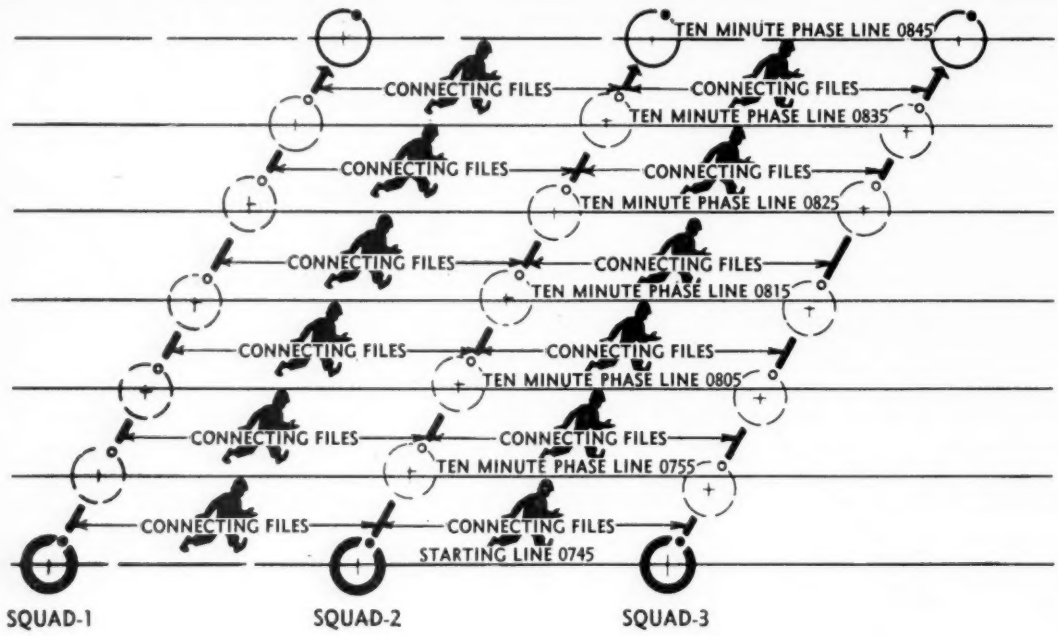

SQUAD-1
SQUAD-2
SQUAD-3
PHASE LINE
200 YDS.
SQUAD-1
SQUAD-2
SQUAD-3
75 YDS.
75 YDS.
THREE SQUADS ADVANCE SIMULTANEOUSLY ON THE SAME AZIMUTH AND HALT AT 200 YDS. SQUAD 1 EXECUTES A RIGHT FLANK MOVEMENT TO CONTACT SQUAD 2. SQUAD 2 LIKEWISE EXECUTES A RIGHT FLANK TO CONTACT SQUAD 3. SQUAD 3 LIKEWISE EXECUTES A RIGHT FLANK MOVEMENT TO A POSITION OUT OF SIGHT OR HEARING OF THE OTHER TWO COLUMNS . . . . AND THE EXERCISE CONTINUES

Figure 11.



SQUADS 1, 2 AND 3 MOVE SIMULTANEOUSLY ON THE SAME AZIMUTH, USING STRIDE SCALES AND SYNCHRONIZED WATCHES, HALTING EVERY TEN MINUTES TO REGAIN CONTACT

Figure 12.

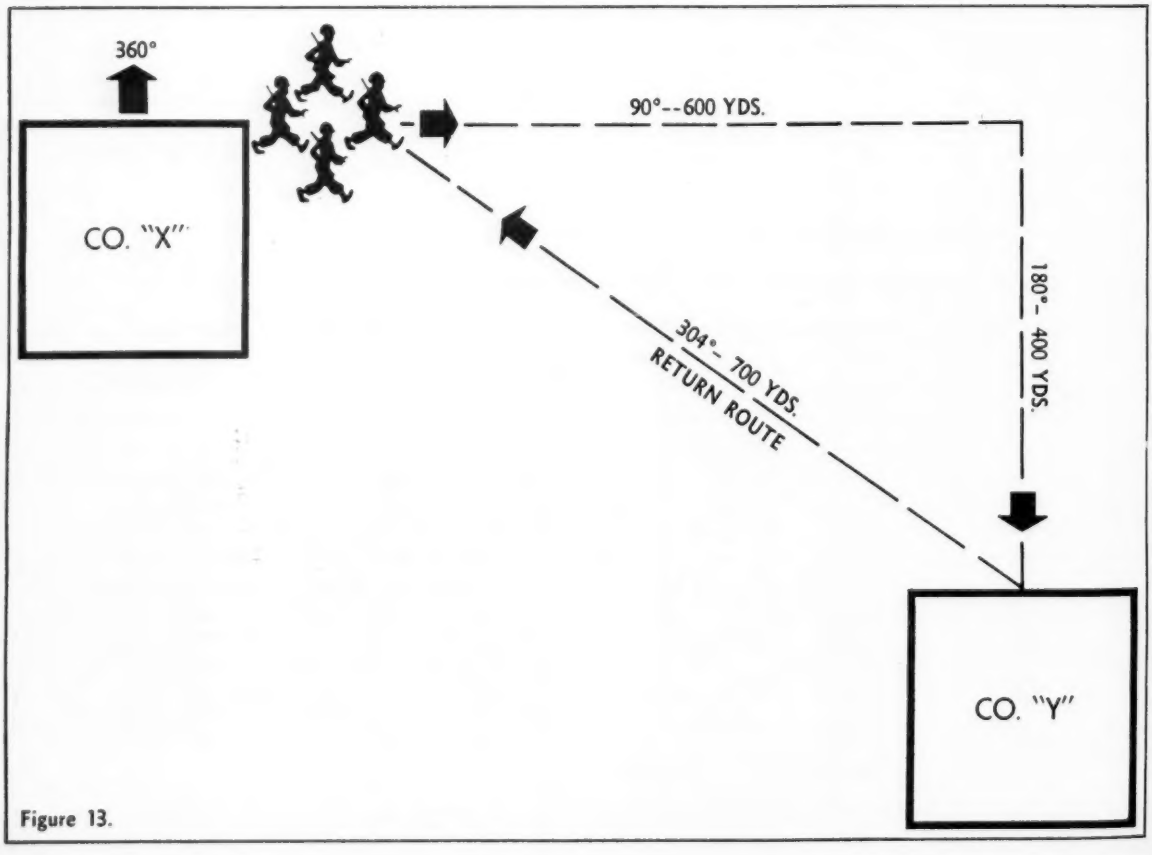


Figure 13.

to the rear. The individual is ordered to proceed 600 yards on an azimuth of 90 degrees, then to turn and proceed 400 yards on an azimuth of 180 degrees. He is told that this course will probably lead him to the adjacent company which is represented by a segment of white camouflage tape, 35 yards long, strung through the trees. The individual assigns one member of the fire team to assist him in following the azimuth course and assigns the other two individuals to pace the distance traveled. When the fire team arrives at the tape, an instructor meets the fire team leader and informs him that the company commander desires to be guided back to the adjacent company and that, since it is late in the day and time is important, he desires to take a quick diagonal route back to the company. The fire team leader is then required to compute the direction and distance on a straight line back to this company and then to take his fire team back to the origin of the patrol. Upon the successful return of the fire team to the point of origin the exercise is completed.

Additional exercises involving the fire team as part of the screen in an advance guard or contact imminent formation or as a flank patrol should be devised to give the individual practice in employing the technique of control. As the training progresses the individual should be given practice in establishing regaining contact with adjacent units in moving situations.

In conclusion, it cannot be emphasized too strongly that the theory of control must be combined with continuous practical exercises in order to develop the technique of control to the point where the individual has confidence in himself, in his unit, and in his leaders. Equally important is the confidence which the unit and the leaders will have in the individual's ability to carry out efficiently his part in maintaining control.

Underwater Marines

MARINES, long accustomed to traveling on the surface, have now gone underwater. The first class in a new, deep-sea diving school at the Marine Corps Air Station, Cherry Point, recently completed its training and three Marines qualified as divers.

Cherry Point, located between the Neuse River and the Atlantic Ocean, is the scene of numerous water crashes. Salvage of the crashed planes was haphazard until Lieutenant L. V. Angelo, crash crew officer, requested the help of trained Navy divers. Impressed with the work of these men, Lieutenant Angelo recommended that a class in deep-sea diving be set up at the Air Station. Authorization was granted by the Commandant on September 30, 1944. Members of the station crash crew were allowed to volunteer. One hundred twenty did so, but physical qualifications for Navy divers are so rigorous that only eleven were accepted for the course.

After a basic training period at Cherry Point, the men spend an intensive three weeks at Washington, D. C., under experienced Navy divers. The final test consists of four 150-foot dives. Men passing this test are rated as divers second class, and are qualified to work at depths of 90 feet, or down to a depth of 120 feet if the officer in charge of salvage so orders. The divers receive extra pay, and bonuses for hazardous work. Raising and salvaging crashed planes is classed as hazardous because of jagged edges, leaking gasoline, and possible bomb loads.

Every precaution is taken to protect the divers. Qualified divers dress the men for their trips underwater, and man the air lines, compressor, and telephone. A man underwater feels more confident when he knows that this work is being handled by someone who has been in the same spot he is in.

The Cherry Point divers have not encountered any serious trouble as yet. They work chiefly in shallow water, where the compression chamber is not needed. So far, none of the Marines has been underwater more than two hours. Three times they have been called to nearby Morehead City for rush jobs on ships. They work from a specially fitted salvage boat, the 104-foot YSD No. 53, which is equipped with a 35-ton crane capable of lifting any twin-engine bomber from the water.—Pvt. Tom Ormsby, Jr.

One of the pioneer Marine divers on his way to the bottom for undersea training.

Coordinating Communications at Guam

How careful planning facilitated the installation, operation, and maintenance of radio, telephone and teletype communications used at Guam. ***By Lt. Colonel A. J. Keller***

In the fight to recapture Guam, the Third Amphibious Corps under Major General Roy S. Geiger was a part of the attacking forces. This article deals mainly with the operation's communications, as handled by the Third Amphibious Corps Signal Officer, his Signal Section, and the Corps Signal Battalion.

A TREMENDOUS amount of planning was necessary in the Guam operation to coordinate the operations of all the communication units throughout the Corps, and to integrate Corps communication activities with Aviation, Army, and Navy communication and signal units. This planning was started as soon as the Signal Section was furnished the necessary basic information in regard to the overall plan of the operation.

One of the first considerations was whether or not plans could be made for using any existing communication facilities on Guam. After a study of available maps and books the conclusion was reached that plans had better start from scratch, because it was evident that there never had been too many communication facilities on the island, and what there was would probably be destroyed either by the Japanese or by our preliminary bombardment.

Using zero existing facilities as a basis, six circuit diagrams and six route maps were drawn up for distribution to the Signal Officers who would be mostly concerned. These drawings were on sheets of tracing cloth approximately four by six feet. They showed the proposed locations of telephone centrals, switching centrals, test stations, number of lines or number of pairs of cable, and the route the lines were to follow. This was the plan for what was called the semi-permanent installation. The assault wire system, of course, was to be installed first during the assault, and then, wherever possible, it was to be converted to follow the plan for the semi-permanent system. After the Island was secured and the Island Commander assumed command, his Communication Officer was to use as much of the semi-permanent installation as possible in installing the permanent system for the island.

Another item that required immediate attention was the writing and issuing of a Signal Operation Instructions (SOI). This meant that all units, Army, Navy, and Marine Corps, operating with or under the Corps, had to be known and provided for in the SOI. In the early stages of the planning, this list of units was naturally quite flexible, consequently the SOI had to be published and distributed even though the status of the units was still undecided. However, all units who might conceivably take part in the operation were included and in that way, as it evidently turned out, very good coverage was obtained.

From previous experience it had been discovered that individual radio operators did not have a very clear idea of what other circuits were being manned, what units were on them, and what the call signs were. In addition, sometimes the operators weren't too sure of the call signs and stations in their own net. To forestall this condition on the coming operation, cards were made up for each circuit being manned by the headquarters, then cards for each circuit were put together to form a book, and each operator was given a book. In this way, the operator had all the information at his fingertips as to his own circuit, as well as the other circuits being manned by the Corps Headquarters. Each card contained information regarding other stations in the net, which station was net control, whether the net was to be operated afloat, ashore, or both; whether it was a voice net or a keyed net, the voice calls or keyed calls, and the primary frequency and alternate frequency. The system proved to be very effective, and was worth the extra work.

Preliminaries That Proved Important

Another idea was tried also—that of printing small cards to be issued to the various officers of the staff. The purpose of this was to make readily available to each staff officer important facts concerning the signal system. These pocket-size cards were prepared to give officers an instant means of finding certain important voice radio calls, a short explanation of the correct voice radio procedure, and some of the higher Headquarters' telephone switchboard names. They subsequently proved well worth the effort.

Another important preliminary was the waterproofing of equipment. This was time well spent and paid dividends during the operation. Of course, the waterproofing wasn't infallible in all cases, and as a result some equipment did get wet—mainly, radio jeeps that of necessity had to travel through the water in crossing the reefs.

One of the points that we had to be particularly careful about in our planning was timing. We had

to be sure that our communication equipment arrived on time so it could be tested, and faults corrected. Men had to be familiarized with the equipment, and then it had to be repacked for shipment.

The Signal Battalion was finally loaded and ready to go on a large number of transports, cargo ships, and LSTs. It was necessary to cut down on some of the vehicles for lack of space. However, enough were loaded and taken to do the job—if there weren't too many breakdowns or casualties due to enemy action. We hoped there would be no mishaps since communication units must have plenty of vehicles. They are needed for messenger runs, carrying wire and cable, and line maintenance work.

The Battle of Saipan had given the communication personnel, embarked for the attack on Guam, an excellent opportunity to test our shipboard communication and internal routing of messages to the various staff officers. Listening watches had been set up on all the radio nets in use by the forces attacking Saipan. The messages thus intercepted were treated as regular incoming messages, processed, and routed according to the prearranged communication plan. The volume of traffic was sufficient to give the Headquarters Communication personnel and the staff a good workout and to give all hands an idea of what was to be expected from the communication setup on D-day at Guam.

Preventing Delays in Setting Up

Realizing that it would take some time to locate and set up the Headquarters' normal signal system, certain items of light signal equipment were loaded aboard ship so they would be readily available on D-day for hand portage ashore. This method was decided upon in order that the Corps Headquarters would have an Advance Message Center ashore and set up on D-day. It worked very well. A few lightweight radios entered the most important nets soon after H-hour. A lightweight switchboard was set up, and various units ashore in the same landing area were tied in by telephone, and a message center crew set up for business at the same time. This gave the Corps a setup ashore soon after H-hour.

As soon as they could possibly make it, the LSTs came in as far as the reefs and started discharging their gear. All of the Signal Battalion vehicles were aboard these ships. During this period while crossing the reef, some of the vehicular radios became wet and were thereby temporarily put out of commission. Also, the crossing of the reef caused breakdowns in some of the larger van-mounted radios. It was rough going in and out of the coral pockets with which the reef was plentifully studded. Naturally, these particular sets could not go on the air as soon as they arrived on shore. However, the delay involved was not too serious.

As soon after H-hour as was possible for him to get ashore, the Commanding Officer of the Signal Battalion arrived on the beach and started to collect his Battalion. It was necessary for him to arrive early because of the way his unit and equipment were scattered throughout the convoy. He also saw to it that the Advance Message Center site was located and the setup started. The location selected was some distance below the town of Agat in the First Provincial Brigade landing area. As the Third Marine Division landed further north to the south of Agana, wire communication was not possible until the two forces joined.

By D plus 2-day a reconnaissance was started for the purpose of locating the Corps Command Post. A site was selected in the town of Agat which had been cleared except for a few snipers. The next day a detail from Corps Signal Battalion started digging in at the sites selected for the various communication activities.

The Corps Command Post did not remain long at Agat. Within a few days of the set up there, it was moved to a location on a hill inland from the town of Agana, the capital of Guam. This location turned out to be the final Command Post for Corps Headquarters during the Guam operation.

A one-story house within the Command Post area was chosen as the center for communication activities. The house was well ventilated, having been fairly well shot up during the preliminary air and naval bombardment. The main ventilation came from where the roof used to be. However, by using canvas the building was made waterproof.

The main switchboard was placed in the cellar, as was the teletype switchboard. The message center including the code room was set up on the first floor, and the signal office operated in the garage. The radios were scattered throughout the area for safety's sake.

Other Corps switchboards were located at various points in the recaptured areas as switching centrals, in order to give flexibility to the wire system. Field wire and cable was laid basically according to plan, although, of course, there were "on the spot" changes due to unforeseen happenings. As usual, the wiremen did an excellent job in installing and maintaining the wire system.

The teletype network again proved to be a fine method of communication and the teletype switchboard was invaluable.

Radio's Limitations Become Evident

Naturally, during the initial stages, radio was used more than it was later when the wire system was installed. All in all, radio communication was good. Of course, the same old bugaboos were on hand, such as: Too many stations in one voice net with resultant confusion and delay in getting off messages; too much extraneous conversation on the voice nets; too much calling and checking signal strength.

Incidentally, it was found that the small "flea-power" radio sets have a definite use, but that when an attempt is made to make the sets do more than they are designed to do, the results are far from

satisfactory. To get good, reliable radio communication over the type of terrain the Corps encountered, it was necessary to use sets with ample power, in conjunction with the correct selection of frequency and antenna location. This latter point—good antenna location—is too often disregarded in favor of some other advantage.

The question of "radio silence" is worth considering. As it turned out, the whole subject was purely academic. For some two weeks prior to the landing, various ships and planes shelled and bombed the Island and used radio for spotting purposes. On the morning of the landing, the troops opened up in their radio nets in the LVTs and landing boats as soon as they were waterborne. There was no point in keeping "radio silence" once ships were in the transport area and darkness had lifted.

As far as the Corps Message Center was concerned, it operated normally and as planned for the operation. A brilliant stroke by someone caused an amphibious truck (DUKW) to be assigned to the Message Center. This vehicle proved to be a wonderful time saver on the messenger runs. Up to the time it was received, messengers had to drive to the beach and make their way the best they could to the various ships concerned in the mail run. Afterwards, it was only a matter of driving down to the water's edge and then keeping on through the water.

A word might be said now in regard to signal supply during the Guam operation. In fact, only one word is necessary, and that word is "excellent." Except for one or two cases there were adequate amounts of everything needed to install, operate, and maintain the communication system.

The careful communication planning, plus the hard work of the communication personnel, paid dividends in that it all went toward the defeat of the enemy on Guam in a minimum of time. Certainly all communicators, at least, received a thrill when they heard that Colonel Nels H. Nelson, the Third Amphibious Corps Signal Officer, had put Guam on the airways for the first time in two and a half years, when he radioed to Pearl Harbor: "This is Radio Guam. Nothing heard from you since 1941. Greetings."

He's Your Wire Man

THAT unimpressive looking length of wire snaking its way back through the jungle, or across the hot kunai grass, is an integral part of modern warefare. That wire you stumbled over and cursed, that wire you kicked viciously or ran over with your vehicle, might well contain your fate, whether you are a general or a private.

If that line goes out, much may go with it. The lives of fit fighting men may be sacrificed, and a sector may be wiped out. A line out causes a weak spot, on which the enemy can close in viciously.

The closest of cooperation is essential in modern warfare, to activate the various weapons and equipment that have been devised to make it so deadly. Tanks and artillery have to be employed at the right moment. The fire of mortars, antitank guns, and machineguns must be carefully coordinated.

A "life line" of battle runs from this Iwo foxhole to call artillery support for infantry.

The commanding officer has to be informed of what is taking place—what the enemy is doing, how his troops are making out, what he needs now, what he will need tomorrow. All this complex maneuvering, planning, and action can only be effective if it is coordinated. The bravest and best equipped troops in the world are of little value unless they are put to use at the right time and in the right spot.

Communication makes coordination within a fighting unit possible.

Wire communication makes person to person conversation possible. A commander, for instance, can request support by telephone and be told what kind of support he'll get, when he'll get it, and what to do in case he doesn't.

Radios are fine things—when they're working. But radios that can be carried on men's backs, through the underbrush, across streams, and up mountainsides, are not powerful or sturdy enough to function faultlessly.

Wire is the ever ready, reliable, standby.

Anything you do, as an infantryman, tank driver, jeep jockey, bulldozer operator, or anything else, to protect and safeguard that wire will benefit *you*.

Remember, when you see a field lineman, sweating and harassed, laying his wire through spots that you can barely walk through—he's laying that wire for you. He would rather grab a rifle and join the fight. It would be easier and more fun, but he is working for you. Help him out. He's *your* wireman!—By 1st Lt. G. A. Barrett.

Resection with Precision

A method of determining coordinates by resection, which provides greater accuracy than is possible with standard methods that are now being taught in artillery schools. *By Lt. Colonel M. L. Curry*

WHILE the 10th Marines were in New Zealand, one of the battalions found the listed coordinates of a certain triangulation station to be badly in error and set about to determine the correct ones by resection using distant points known to be correctly located. Two entirely different survey teams working independently of each other obtained exactly the same answers to the nearest yard. As a further verification, the coordinates of the point thus determined were used to calculate the azimuths to four known distant points, varying from 2,000 to 5,000 yards distant, and the readings actually taken by instrument checked to the nearest mil.

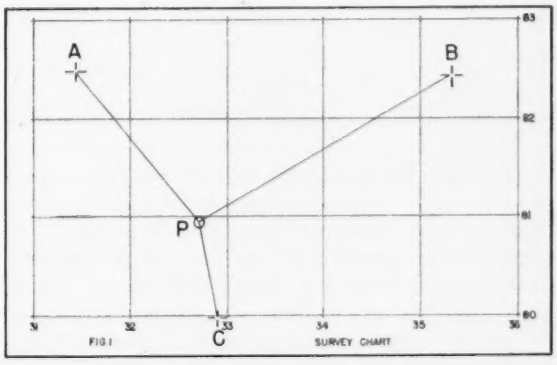
The method used may be of interest to those who wish to determine coordinates by resection with greater accuracy than is possible with the standard methods currently taught in artillery schools. Certain text books on advanced surveying do give methods for calculating resections, but they involve rather complicated formulae. It is believed that the method to be described here can be easily understood and memorized by the average artillery survey officer for future use.

The basic difficulty which limits the accuracy obtainable with any of the standard methods of 3-point resection is the small scale (1/20,000) to which the plotting is generally done, and the fundamental idea of the proposed system is a great magnification of the area where the rays intersect so they can be handled with ease and accuracy.

Assume the situation to be as shown in Figure 1. A, B, and C are distant points of known coordinates and P is the point to be located by resection. First of all, we must locate the general area around the point in question; this is done by determining its "approximate coordinates," or more specifically by finding the coordinates of a point near the one in question. Any point will do to start with providing it is not too far away from the exact location sought; within 50 yards is satisfactory. These approximate coordinates are actually those which we have heretofore accepted as final when using a standard method of resection; the tracing-paper method is simple and satisfactory. So make your resection as you have always done, using your favorite method, but refer to your answer this time as your "approximate point" (referred to hereafter as point Q). This point Q, although *near* the point P sought, is never materialized on the ground. It is simply an auxiliary point used in the calculation and later discarded.

Next use a standard piece of coordinate or "graph" paper, divided into inches and tenths of inches and let 1/10 inch equal one yard. A piece of graph paper 8 by 10 inches should be large enough. Label the vertical heavy line through the center of the graph paper the Y axis and horizontal heavy line through the center as the X axis. The intersection of these two axes is your approximate point Q just located (center of large circle in Figure 2), and the sheet of paper represents the area around this point (an area about 80 yards by 100 yards). If the preliminary work has been carefully done, the exact location of the point P in question is somewhere else on this sheet of paper, and the problem is to find out just where it is with respect to this approximate point Q. If your resection involved an error greater than 50 yards, you can't expect to find the exact location of P on your 8 by 10 sheet of graph paper. In this case you need practice badly and are not ready for any "fancy ideas" anyway.

Before proceeding farther, let's analyze what happens in the case of a resection. The method commonly used is to set up an angle measuring instrument at the point P, whose coordinates are to be determined, and then measure the angles between the three distant known points A, B, and C used for resection. The azimuth of one of these rays is determined and the other two calculated by applying the measured angular differences between them. The back azimuths of these rays are then plotted through their respective points of origin on the survey. If the work has been per-



The original of this chart, drawn to a 1/20,000 scale, measured 9 by 5⅜ inches.

The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

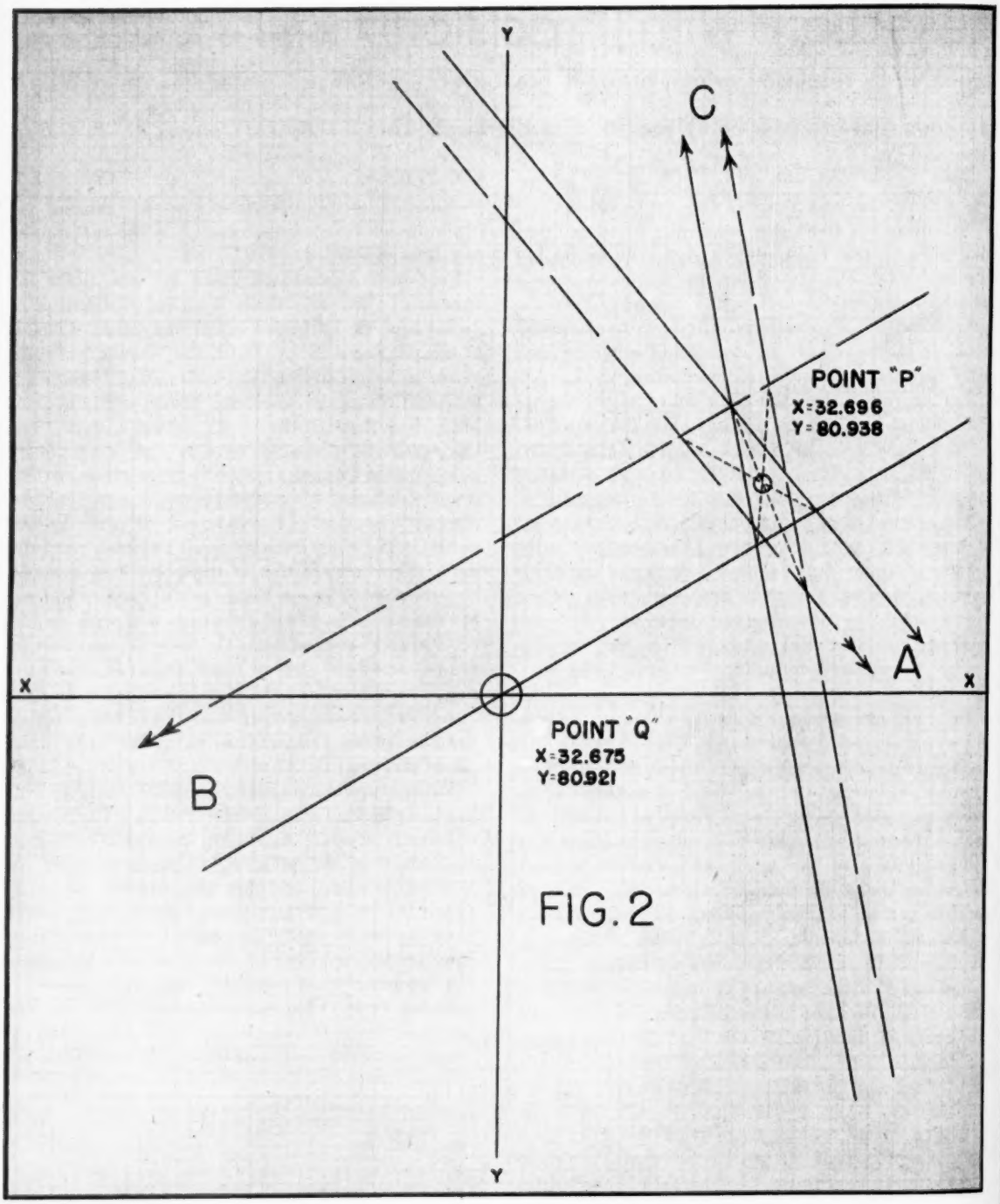


FIG. 2

fectly done, the three rays will intersect in a point, which is the location sought by resection. However, a small error of orientation is generally involved in determining the azimuth of the first ray, and, since the azimuths of the others are based on this one, they will have errors of the same angular magnitude and in the same sense. In other words, instead of intersecting in a point, the three rays will be rotated about their points of origin, all in the same direction (clockwise or counterclockwise) and through the same angle, forming a triangle of error. If the rays are then rotated in such a manner as to reduce the size of the triangle, its area will finally become zero, at which point the problem is solved. If we continue to rotate the rays past the zero point a second triangle will appear, inverted with respect to the first. Locating the exact zero point is usually difficult, but inverted triangles of error can generally be obtained with relative ease. Lines connecting the corresponding vertices of these

inverted triangles of error intersect at the point sought.* It should be distinctly understood that these three rays bear a definite relationship to each other; when one is rotated in a certain direction and through a certain angle, the other two move in the same direction and through the same angle as if

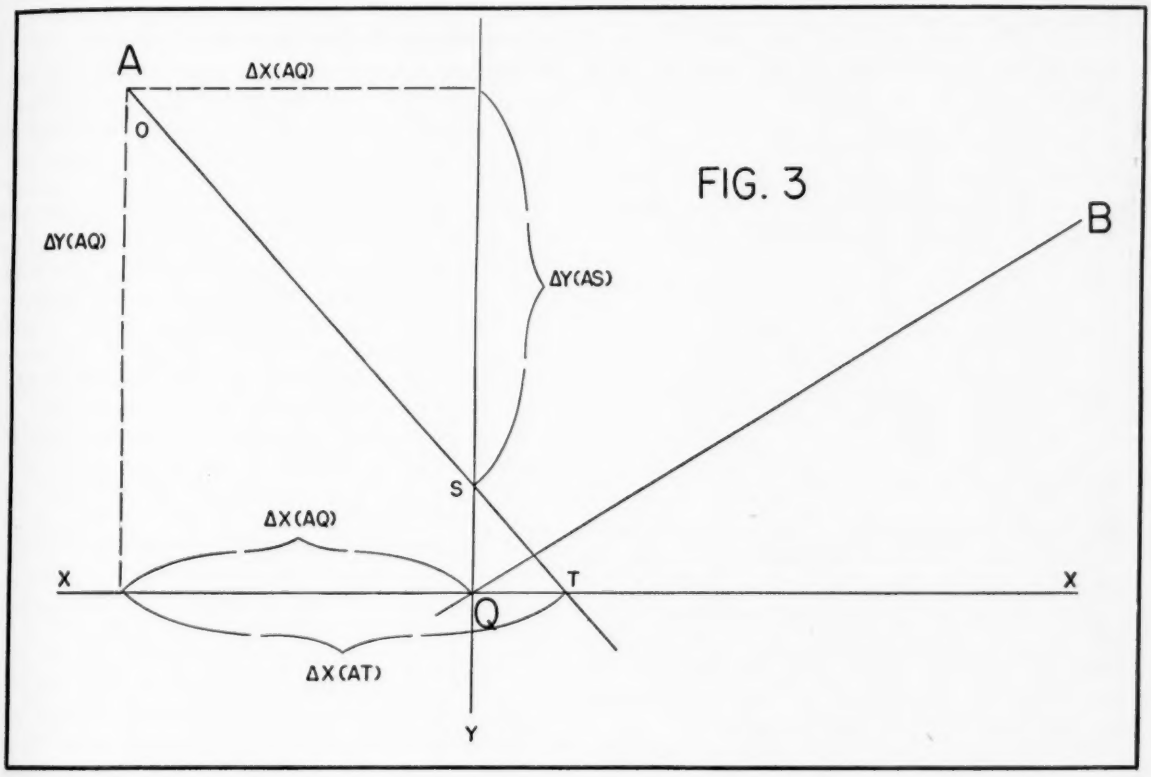


FIG. 3

Footnote: It was stated that, "Lines connecting corresponding vertices of these triangles of error intersect at the point sought." In the case considered, this is true for all practical purposes, but this general statement should not be accepted without qualification. If, in Figure 5, from a point of station P we measure the angle between only two known distant points A and B, the point P is indeterminate since it may lie anywhere along the circle through A, B, and P; it could be at P or it could be at P'. However, with the use of a third point C, the location of P can be determined, as it is fixed by the intersection of the circle through A, B, and P and the circle through B, C, and P (Figure 6). In like manner it will also lie on the circle passing through A, C, and P (Figure 7). The relationship in the vicinity of P is shown enlarged in Figure 8. The triangle of error XYZ is formed by the rays from the points A, B, and C, and having a common error of orientation. The inverted triangle X'Y'Z' is formed by rotating the rays in the opposite direction. It should be noted that the apexes of the triangles lie on the circles and as the rays are rotated toward P the areas of the triangles approach zero, and the apexes approach P *along the arcs of circles.* The straight lines connecting the corresponding vertices (dotted in Figure 8) approximate the circular arcs and are acceptable only if the arcs are small or, in other words, if the triangles are small. It is obvious, of course, that their point of intersection O does not coincide with P, and when plotted to the small 1/20,000 scale this solution may cause a serious error, *unless the triangles of error are very small.* If, for example, Figure 8 were plotted to a scale of 1/20,000 the error involved in locating P by connecting the corresponding vertices would be in the neighborhood of 100 yards. Solution of the triangle of error will generally give good results if the sides of the triangle do not exceed 30 yards to the scale used. Plotted to a 1/20,000 scale such a distance measures about .054 inches, but plotted on the graph paper in the vicinity of Q, discussed above, to a scale of 1/360 (1/10 inch equals 1 yard), 30 yards on the ground measures 3 inches on the paper. In the example given in this article the triangle of error is only about 1/3 that size and would be virtually impossible to solve at a 1/20,000 scale. In order to "keep from going blind" when solving triangles of error on a 1/20,000 survey chart, inexperienced personnel are sometimes tempted to form deliberately large inverted triangles to facilitate drafting. The danger of such procedure should be apparent.

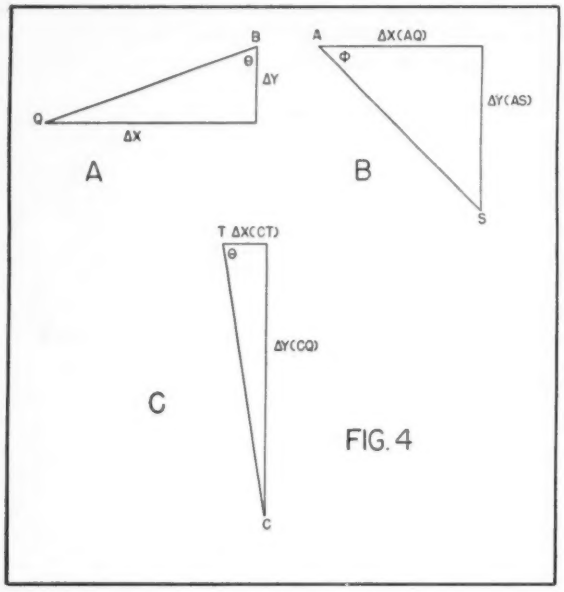


FIG. 4

they were geared together. For each position of one there are definite corresponding positions for the other two, so that if one ray is drawn in the vicinity of the point sought, the positions of the other two are automatically fixed (this is true only when the azimuths of two rays are based on the azimuth of the third). It is on this principle that the technique under discussion is based.

In order to get our three rays on the piece of graph paper representing the magnified area near the point P to be determined, we can start by passing any one of the rays through the approximate point Q. For this we need only know its azimuth. Since we know the coordinates both of the approximate point and the selected distant point, the azimuth can be calculated and the ray drawn. Remember that the other two rays now have definite positions corresponding and will form a triangle of error with the first when drawn.

The question now is, which of the distant rays should we start with? Remember, the error is essentially one of orientation. The initial azimuth is determined by the coordinates of two points, one near the point sought and the other at a great distance. The farther away the distant point is, the less will be the directional error of the ray with respect to the point sought. Therefore, we select the most distant point to calculate this initial azimuth in order to have the least directional error with respect to the point sought, P. We could start with either of the other two, but we would have a larger triangle of error which we might not be able to plot, since our piece of graph paper represents a comparatively small area. So with the differences of the Xs and Ys of the most distant point and the approximate point we calculate the initial azimuth and draw a ray through Q (the intersection of the X and Y axes on the graph paper) with the azimuth thus determined (ray B on Figures 2 and 3). The positions of the other two rays are now automatically fixed but we still have to find out exactly where they are.

Determining the Corresponding Azimuths

Having calculated the azimuth of the ray we have selected to pass through Q, the corresponding azimuths of the other two are determined by applying the measured angular differences. They are now, therefore, rays of known azimuths passing through known distant points. Before determining where the second ray passes, consider Figure 3. A is the distant known point from which the second ray originates and the azimuth of this ray has been determined. From this azimuth the angles θ and ϕ can be determined. Since we have deliberately passed one ray through Q, the second probably will not pass through it but should pass to one side or the other, and will intersect the Y axis through Q at some point S and the X axis at T. The coordinates of A and Q being known, we can determine the differences of their X and Y coordinates, and call them $\Delta X(AQ)$ and $\Delta Y(AQ)$ respectively. Now with $\Delta Y(AQ)$ and θ we can solve for the ΔX of A with respect to T — or $\Delta X(AT)$. Comparing $\Delta X(AT)$ with $\Delta X(AQ)$ we can determine whether T lies east or west of Q and by how much. Knowing how many yards east or west of Q the second ray intersects the X axis and at what azimuth, we can draw this ray on the graph paper (ray A in Figures 2 and 3). Obviously we could get the same result by starting with $\Delta X(AQ)$ and ϕ and solving for $\Delta Y(AS)$. It is best to avoid acute angles between rays and axes as the intersection may fall off the graph paper, and this consideration governs the procedure. The ray from the remaining point is determined in the same manner (ray C in Figure 2). We now have a triangle of error in the vicinity of the approximate point Q.

The next step is to solve the triangle of error. Remember that all the rays have the same angular error of orientation and the procedure is to rotate them all in the same direction (clockwise or counterclockwise) to obtain an inverted triangle of error.

How to "Rotate" the Rays

A special method is used to "rotate" the rays. First of all, they are not actually rotated but are moved parallel to themselves. This is permissible since the amount of their lateral displacement at their area of intersection is very small compared to their lengths. The error introduced is negligible. In the second place, it should be remembered that the amount of the lateral displacement is proportional to the length of the ray, all rays being "rotated" through the same angle.

Proceed as follows: place an arrowhead on the end of each ray indicating its direction and label

it with the point of origin for identification. "Rotate" the longest ray by moving it parallel to itself an arbitrary distance (from one to two inches is generally sufficient), either clockwise (to the right looking along the arrow toward its head) or counterclockwise. Inspection of the triangle of error will indicate in which direction the ray should be rotated to reduce the size of the triangle. Having moved one ray, the direction and amounts the others must be moved is automatically determined. If the first is moved clockwise, the other two must also be moved clockwise and vice versa. The lateral distances the second and third are moved are proportional to their lengths on the ground, with respect to the first. For example, if the first ray is 4,000 yards long and is moved two inches, and the second ray is 2,000 yards long, it is moved one inch, and so on. If the second triangle is inverted with respect to the first we have rotated the rays correctly. If it is larger but not inverted, we have gone the wrong way; if smaller but not inverted, we have gone the right way but not far enough. The amounts which the rays should be displaced can also be determined by the mil formula, calculation being based on an arbitrary angle of rotation and the lengths of the rays.

After having obtained our inverted triangles, the corresponding vertices are connected by straight lines. These should intersect in a common point which is the exact location of P, the point sought. Knowing the coordinates of Q, those of P are easily determined by inspection.

The following example should serve to clarify the procedure. In Figure 1, the coordinates of the known points are as follows:

Point	X	Y
A	31,400	82.480
B	35.310	82.431
C	32.882	79.963

The Instrument Sergeant sets up his aiming circle at P and measures the angles between the distant known points (which have been plotted on the survey chart), and obtains the following readings:

∠ APB	1783 mils
∠ BPC	1937 mils
∠ CPA	2680 mils

Using these measured angles, the location of the approximate point Q is determined by a tracing paper resection giving the following coordinates:

$$X = 32.675 \qquad Y = 80.921$$

(This is the exact location of Q or the *approximate* location of P).

X and Y axes are drawn in the center of a piece of graph paper. The intersection of these axes are assigned the coordinates of Q just determined (center of larger circle in Figure 2).

With the coordinates of the point Q and of the most distant point B we calculate the first azimuth. (See Figure 4 A).

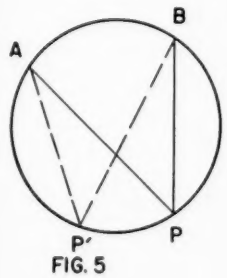


FIG. 5

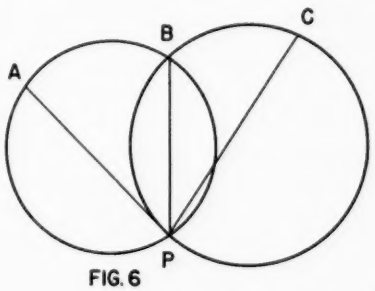


FIG. 6

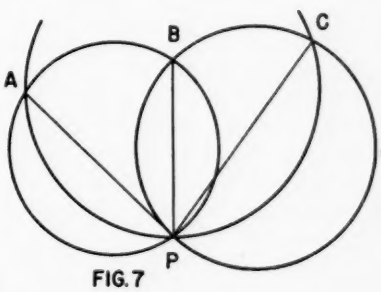


FIG. 7

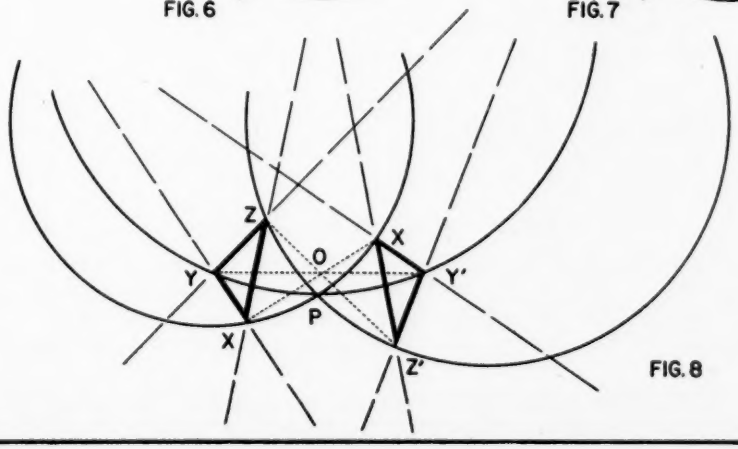


FIG. 8

$$\text{Tan } \theta = \frac{\Delta X}{\Delta Y}$$

$\Delta X = 2{,}635$ yds.	log 3.42078
$\Delta Y = 1{,}510$ yds.	colog 6.82102
$\theta \quad (+3200) = 4270$ mils	log tan 0.24180

4270 mils is the grid azimuth of the ray from B to Q, so through Q we draw a ray with the azimuth 4270 mils and label it B with a single arrowhead to indicate its direction (Figure 2). The second position of the ray will be indicated by a broken line and a double arrowhead).

Next to locate the ray from A. Since the azimuth from B to Q is 4270, and the angle between the rays from B and A was measured as 1783, the azimuth A to T (Figure 3) is determined by subtracting 1783 from 4270, which is 2487 mils (a simple rough sketch will indicate whether the angular difference should be added or subtracted). Now we determine

$\Delta X(AQ) = 1{,}275$ and $\Delta Y(AQ) = 1{,}559$

From Figure 4 B

$$\text{Tan } \phi = \frac{\Delta Y(AS)}{\Delta X(AQ)} \text{ or } \Delta Y(AS) = \Delta X(AQ) \text{ tan } \phi$$

(ϕ is the azimuth from A to S minus 1600 mils)

$\Delta X(AQ) = 1{,}275$ yds.	log 3.10551
$\phi = 887$ mils	log tan 0.07455
$\Delta Y(AS) = 1513.8$ yds	log 3.18006

$\Delta Y(AQ) = 1{,}559$

$\Delta Y(AS) = 1{,}514$

$\Delta Y(AS)$ is less than $\Delta Y(AQ)$ by 45 yds. The ray from A therefore intersects the vertical axis through Q 45 yards north of it on a grid azimuth of 2487 mils. The ray is drawn thus on the graph paper (Figure 2).

We next locate the ray from S. The azimuth of this ray is found by adding the angle between the rays from B and C (1937 mils) to the azimuth from Q to B (1070 mils), the result being 3007 mils. In the sketch C of Figure 4, the angle θ is 3007 mils —1600 mils or 1407 mils.

$\Delta X(CQ) = 207$ yards and $\Delta Y(CQ) = 958$ yards. To avoid the acute angle between the ray from C and the vertical axis through Q (indicated by inspection on the survey chart), we will, in this case, solve for $\Delta X(CT)$ to see where the ray intersects the horizontal axis through Q.

In Figure 4 C

$$\text{Tan } \theta = \frac{\Delta Y(CQ)}{\Delta X(CT)} \text{ or } \Delta X(CT) = \frac{\Delta Y(CQ)}{\text{Tan } \theta}$$

$\Delta Y(CQ) = 958$ yds.	log 2.98137
$\theta = 1407$ mils	colog tan 9.28280
$\Delta X(CT) = 183.7$ yds.	log 2.26417

$\Delta X(CT)$ is 23 less than $\Delta X(CQ)$. The ray from C, therefore, intersects the horizontal axis 23 yards east of Q on a grid azimuth of 3007 mils (Figure 2).

The exact point P lies within the triangle of error formed by the three rays to the northeast of Q. Inspection of the triangle will show that it will be reduced in size by rotating the rays clockwise, that is to the right looking along the arrows toward their heads. Reference to the survey chart shows B to be 3,000 yards away, A to be 2,000 yards away, and C to be 1,000 yards away. Since the ray from B is longest, we will move it first, to the right parallel to itself a distance of one inch. A must then be moved to its right ½ inch and C to its right 1/3 inch (distances proportional to the lengths of the rays). Their displaced positions are shown in Figure 3 as broken lines and with double arrowheads. The displaced rays give a triangle of error inverted with respect to the first. The dotted lines connecting the corresponding vertices of the two triangles intersect in a point which is the exact location of P (center of the smaller circle in Figure 3). Inspection shows P to be 2.1 inches east and 1.7 inches north of Q. Since we have let 1/10 inch equal 1 yard, the coordinates of P are found, in this case, by adding 21 to the X coordinate and 17 to the Y coordinate of Q:

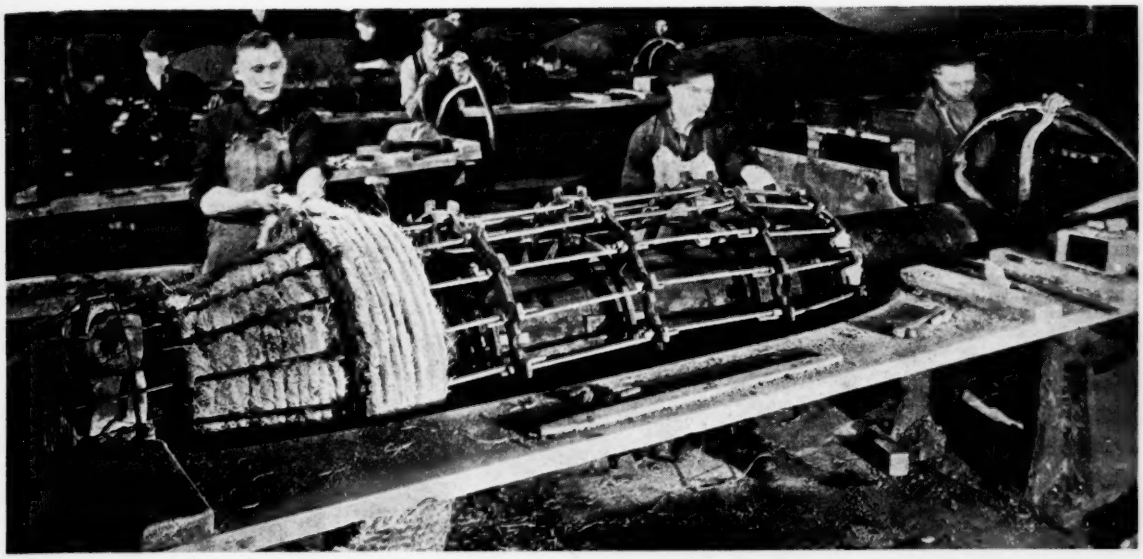
	X	P
Q	32.675	80.921
	+21	+17
P	32.696	80.938

This is, admittedly, a lot of work, but if you want a high degree of accuracy, this method will give it to you. If the distant points are accurately known and the work carefully done, coordinates can generally be determined within one or two yards. After you get the hang of it, one of these problems can be worked in an hour or less and it requires far less computation than other methods of calculating resections.

Four Star Rank for Commandant

For the first time in its history, the Marine Corps is commanded by a full general. On April 3, Congress authorized the promotion of Lieutenant General A. A. Vandegrift, Commandant of the Corps, to the rank of general, and General Vandegrift became the first Marine on active duty to receive the four star rank.

General Thomas Holcomb was retired with four star rank on January 1, 1944, when he was succeeded as Commandant by General Vandegrift.



Initial stage in the production of a British 11-ton "Volcano" bomb. The mammoth projectile is cast round the framework, wound with rope made from wood shavings.

Most Destructive Lethal Weapon

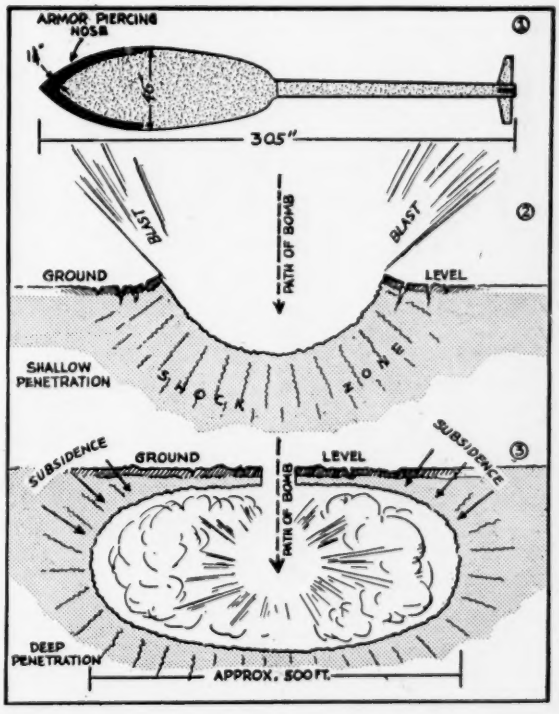
AN 11-ton bomb, the "Volcano," made in the United States from British designs, now is being used in Allied air raids over Europe. The bomb is 25 feet five inches long and three feet 10 inches thick, and somewhat resembles an oar in outline. It carries about 11,000 pounds of explosive in the nose. Its hard nose is designed for maximum penetration against deeply buried installations. It has tail fins and drops in a curved line, part of its course paralleling the course of the plane.

Planes of the United States 8th and 9th Air Forces are not equipped at present to carry this giant bomb, but Britain's heavy bombers, the Lancaster and Hailfax, which have long, shallow bomb racks, have been specially adapted for them. The bomb was designed by a Briton, Barnes Neville Wallis, who worked on it with RAF authorities.

The British Ministry of Aircraft Production has called the town buster "the most destructive lethal weapon ever made." During the period of experimentation with it, a dummy weighing 22,000 pounds and filled with inert material was dropped from operational height. The dummy penetrated the earth to such a depth that 18 men, working 12 hours daily, took nine days to find it.

Explosives experts have estimated that the bomb, if equipped with a short time fuse, could cause complete demolition of an American city area of roughly 600 feet square. In the case of European-type construction in which the floor beams are in niches in the walls, it might level many city blocks.

The bomb was designed for general use—for shallow or deep penetration. If the fuse were set for deep penetration, the bomb would plow its way through earth to a depth of about 70 feet and detonate, causing major shocks of the earthquake type and result in weakening the foundations and causing total or partial collapse of buildings in the explosion area. Condensed from *The Washington Star*.



Both shallow and deep penetration zones of the 11-ton bomb, shown on top, are indicated here.

Franklin Delano Roosevelt

Every Marine will learn with profound sadness of the death of President Roosevelt. Probably no other man of his day promoted so consistently the welfare of the United States Navy and all of its services. His leadership of the country in the time of its greatest danger and distress was ever sure and far-seeing. He had brought a distracted world to the very threshold of peace. The millions who mourn him may well wish that he had lived to see his last great aims achieved.

A. A. VANDEGRIFT,
General, U. S. Marine Corps
The Commandant of the Marine Corps

Washington
12 April 1945

FRANKLIN DELANO ROOSEVELT, 63, the 31st President of the United States, died at Warm Springs, Georgia, on Thursday, April 12, while serving his fourth term as chief executive and commander in chief of the armed forces. He was stricken by cerebral hemorrhage and died while unconscious in a modest resort house guarded by Marines and secret service men. Funeral services were conducted in the East Room of the White House on Saturday, April 14, and the body was interred at the Roosevelt family home, Hyde Park, New York, on April 15.

Secretary of the Navy James Forrestal ordered the national colors displayed at half mast throughout the Naval establishment for a 30-day period beginning Friday, April 13. Because of war conditions, the wearing of mourning badges and the firing of salutes was not ordered.

The death of the Nation's 31st president deprived the Navy of one of its strongest friends. As a boy, Mr. Roosevelt desired to enter the United States Naval Academy, but in accord with family tradition he received his schooling at Groton Academy and Harvard. He studied law at Columbia Law School in New York City and then entered practice of law in New York City. He was married in 1905 to his sixth cousin, Eleanor Roosevelt. Three of their five children, Marine Colonel James Roosevelt, Lt. Commander Franklin D. Roosevelt, Jr., and Lieutenant John Roosevelt, are in the Naval forces. Another son, Brigadier General Elliott Roosevelt, is in the Army. Their only daughter, Mrs. Anna Boettiger, resides in Washington.

Mr. Roosevelt entered politics in 1910, when he was elected to the New York Senate. He accepted the post of Assistant Secretary of the Navy upon the election of Woodrow Wilson to the presidency in 1912. His record in this post was admirable. At San Francisco in 1915, after the sinking of the Submarine F-4 off Hawaii, Mr. Roosevelt went aboard a submarine which was ordered to make repeated dives in an exhibition to boost Navy morale.

Mr. Roosevelt was in the forefront of the strong Navy advocates who, in 1916, obtained a Congressional appropriation for the building of 10 capital ships, six battle cruisers, and an increase in personnel. During World War I he led a group of Naval officers in advocating the laying of a mine chain across the North Sea to combat the German submarines that threatened Atlantic shipping. The chain was begun in March, 1918, and Admiral Sims, who at first had opposed the plan, said this mine barrier was "one of the wonders of the war." Mr. Roosevelt, in July, 1918, conducted an inspection of 50 Naval bases and stations and visited Marines along the western front in France.

After World War I, Mr. Roosevelt engaged actively in politics. He was elected Governor of New York State in 1928, and in 1932 was the successful Democratic candidate for President of the United States.

When the danger inherent in the European situation became evident, Mr. Roosevelt ordered the greatest peacetime rearmament program in America's history. He paved the way for American aircraft factories to supply thousands of fighting planes to France and Great Britain and narrow the German-Italian aerial superiority over those democracies.

Since United States entry into the war, Mr. Roosevelt had worked closely with the heads of the armed services and of allied countries in the planning of overall strategy. He was a visitor at many of our overseas bases and a frequent passenger on vessels of the United States Fleet.

Harry S. Truman, vice president, was given the oath of office as President of the United States approximately two hours and a half after the death of Mr. Roosevelt.

To Keep Them Rolling

Some methods of keeping vehicles on the move in spite of adverse conditions frequently encountered in combat operations. The methods, proved in the field, employ simple engineering principles.

WARFARE today has become a war of machines. Because of this mechanization the officer not only must be trained to keep his vehicles in efficient operating condition, but he also must have sufficient elementary engineering knowledge to "keep 'em rolling" when natural obstacles, such as mud, sand, small ravines or gullies, or steep embankments are encountered.

Much of the equipment needed to overcome obstacles is difficult to procure in the field and certain items such as shovels, picks, axes, jacks, tow chains, snatch blocks, tool kits, and skid chains, must be included as equipment for each vehicle before any operation. When these items disappear or are not available when needed, substitutions and improvisations may be made if a certain amount of imagination and determination is used.

In most situations where field expedients are needed, it becomes necessary to use some type of anchor. Of course, any natural or man made anchor already present, such as a tree or boulder, fence post, or house pillar, would be used whevever possible. However, such anchors may not be available and for this reason other types of anchorage have been developed.

One of these, called the "Deadman" and depicted in Figure 1, is installed to utilize as much surface of undisturbed earth as possible. It is most useful when dug behind a slight rise or mound and far enough away from the obstacle so that it will neither interfere with vehicles emerging from the obstacle nor cause the last part of the pull to be upward. An upward pull has a tendency to uproot the deadman.

This article is based on information in Manual NAVMC-3745, issued by Marine Corps Schools at Quantico, and is presented in this form as a GAZETTE feature.

This anchorage is prepared as follows: A log, three to six feet long and about six to 12 inches in diameter, is cut. This log is placed in a hole about four feet deep and slightly longer than the log. The hole should slant in slightly at the bottom, in the direction of pull. Perpendicular to the hole and with an ascending slope, a ditch is dug for the tow chain to lie in. This is passed around the log with the standing end coming from the bottom so that the log will tend to rotate down and in, rather than up and out of the hole. Pickets may be driven into the ground between the log and the edge of the hole as reinforcement, as shown in the cross section of Figure 1.

Another type of anchorage, shown in Figure 2, is a ground anchor assembly using three ground anchors and 10 iron stakes. The assemblies should be placed in line in the direction of pull. Through the holes, as shown in Figure 2, stakes are driven in as far as possible at an angle of from 30 to 60 degrees to the vertical. The correct method of securing the chain end of the cable is shown in

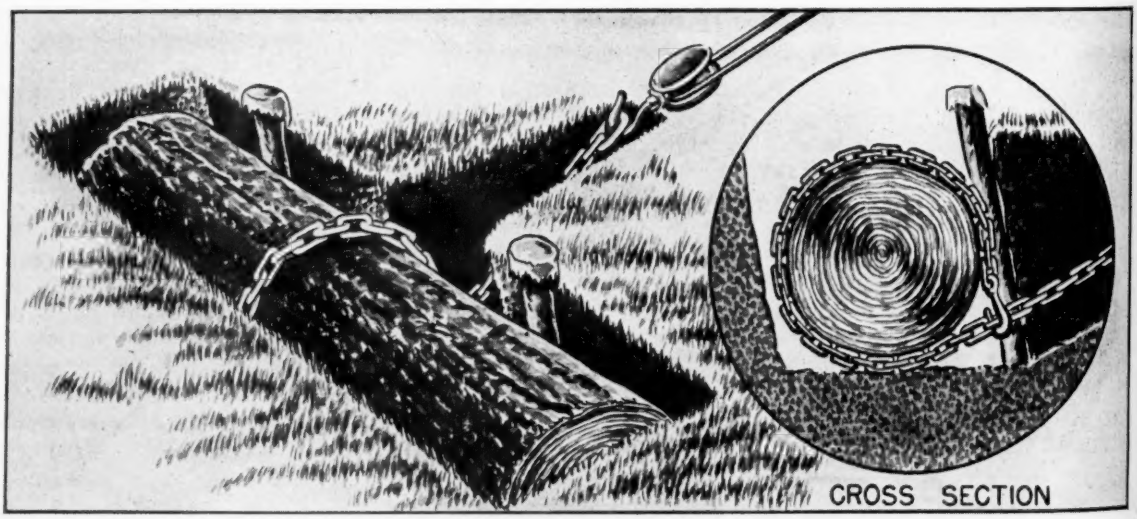


Figure 1.

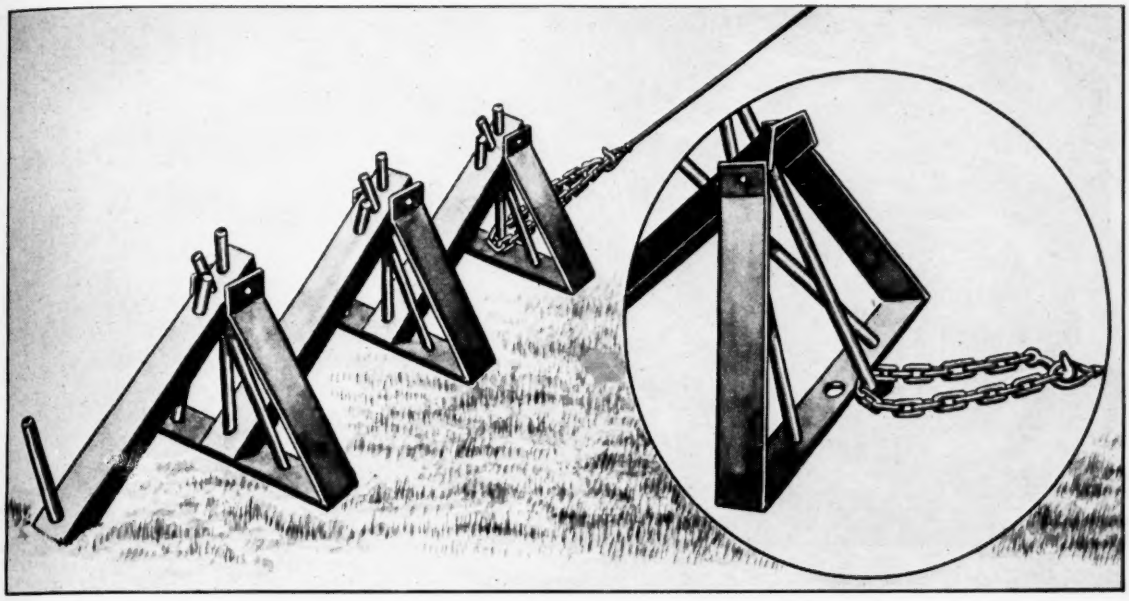


Figure 2.

this figure. The hook should never be placed on the cable itself.

Anchor stakes are depicted in Figure 3. This method requires three iron or wooden stakes and a 30-foot width of one-inch line. One stake is used as an attachment for the cable, but that one stake is reinforced by the two other stakes and the line is slung between the stakes. The first stake is driven in at about a right angle to the ground. Another stake is driven at an angle with the ground, about four feet from the first stake in a direction away from the line of pull. The line is run with a number of turns from the top of the first stake to the bottom of the second stake, using clove hitches at each stake so that the line does not slip. A third stake, passed through the lines and twisted until the lines are tight, is then driven into the ground. Two additional stakes and another line can be used to make this a tandem assembly, giving greater holding strength.

A vehicle may also be used an an anchor. When it is, or when a vehicle is using its winch to pull an object, the vehicle must be anchored. It might be possible to hold the vehicle sufficiently by merely applying the brakes, but often it becomes necessary to supplement the brakes by one of the various types of anchors previously described or by use of a pole anchor.

The pole anchor, which is shown in Figure 4, may be used to supplement the brakes in anchoring a vehicle. It requires two tow chains and an eight-foot timber. The timber is placed ahead of and

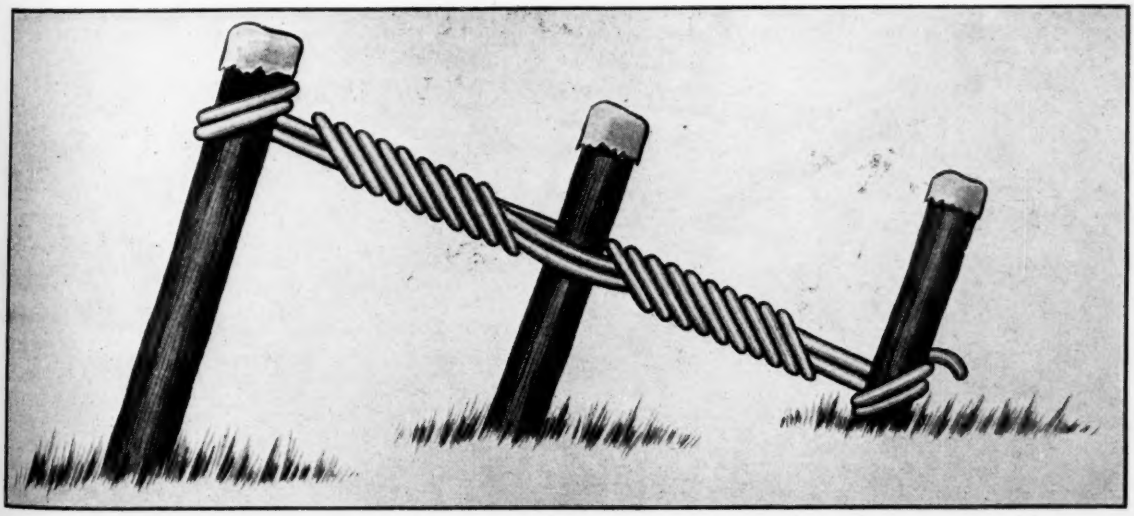


Figure 3.

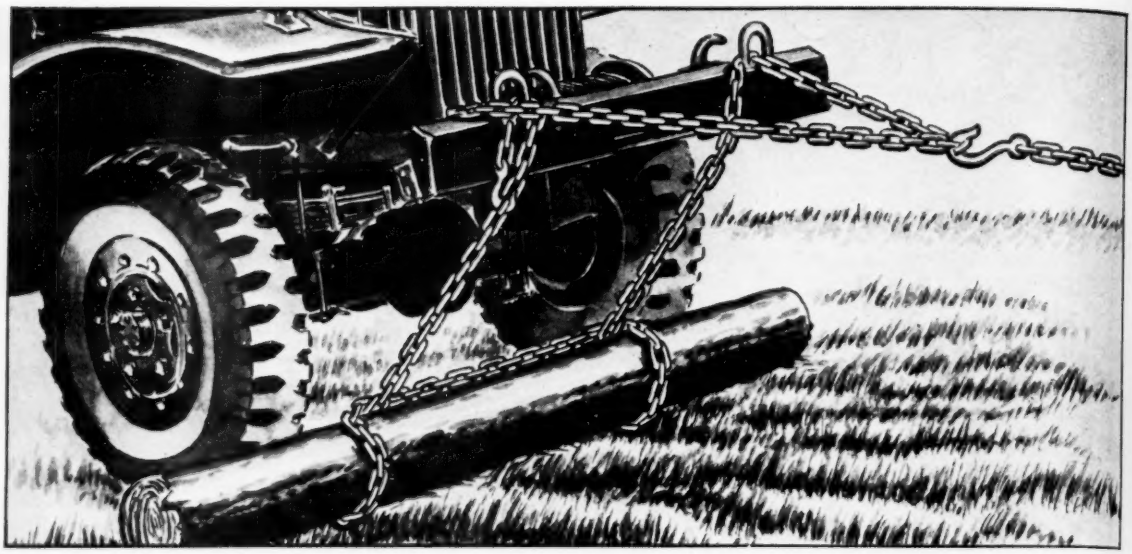


Figure 4.

against the front wheels and secured to the front bumper by the use of tow chains in such a way as to prevent the wheels from rolling over the timber. In this way, the surface in contact with the ground is increased. It is important that the tow chains which hold the timber in place be long enough to allow the front wheels to roll up on the timber slightly but not long enough to allow the wheels to roll over the timber.

Something more than just a straight pull frequently is needed to get a vehicle across an obstacle. The vehicle may be mired very deeply or it may have run against a bank so steep that it is impractical to make use of a straight pull because of the danger of the springs being bent, the frame damaged, or the axle pulled away from the vehicle. To meet this situation an A-frame, shown in Figure 5, is used. This device provides both a lift and a forward pull.

The A-frame is constructed with two logs 12 feet long and from three to seven inches in diameter, chained together at one end. The legs are placed in shallow holes several feet from the front of the vehicle and the A-frame is tilted toward the vehicle in such a way as to get maximum lift with a forward pull. The chain end of the winch cable is run over the top of the A-frame. From the towing hooks of the vehicle, tow chains with a spreader bar placed between them, are run to the hook of the cable chain. (The spreader bar gives a straight

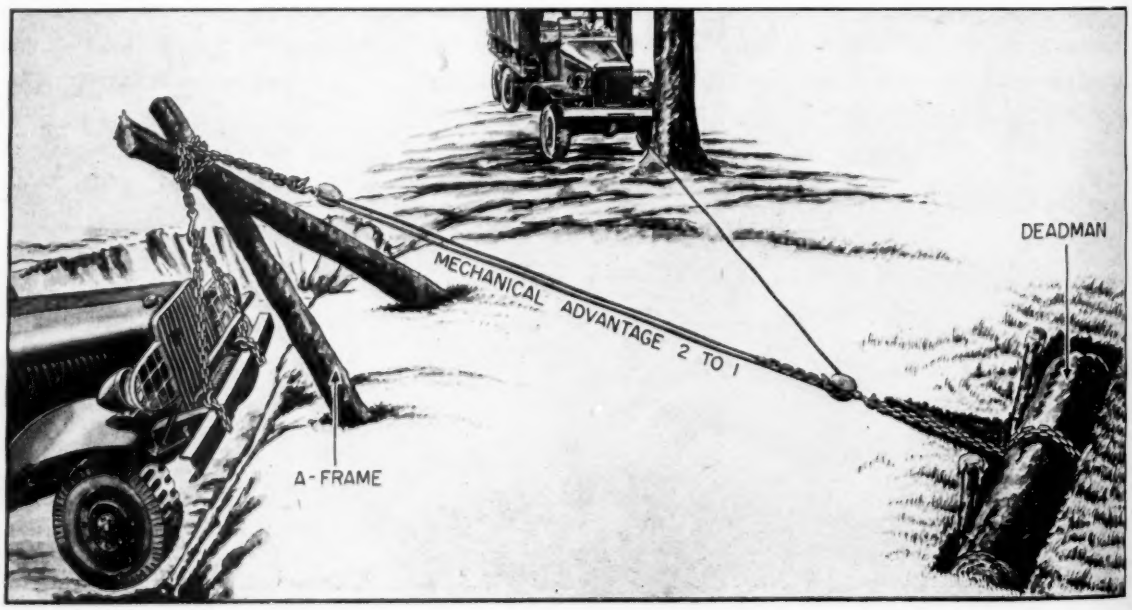


Figure 5.

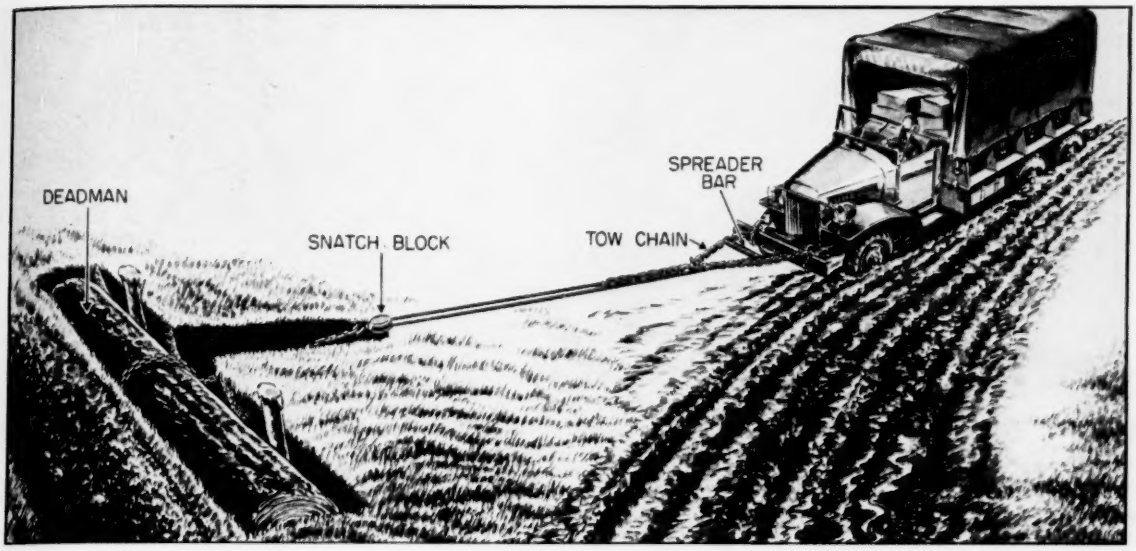


Figure 6.

pull on the hooks.) By reeling in the winch cable, the top of the A-frame is pulled up and back. This lifts the vehicle and hauls it clear of the obstacles. Care must be taken that the legs of the A-frame do not damage the fenders or lights of the vehicles. In some cases, timber longer than 12 feet may be needed to avoid damaging the vehicle.

To cover much distance when the A-frame is being employed, it must be used in steps, and moved forward a few feet in the direction of pull each time. A chain, line, or plank should be installed between the legs to prevent the A-frame from spreading in soft ground. Also, if the ground is soft, the legs of the A-frame logs should be supported in order to minimize the amount of digging in.

If a vehicle is equipped with a winch it may be able to pull itself through mud, sand, or boggy ground, up a steep slope, or over an embankment by use of one of the above expedients. If a straight pull is needed, the winch cable can be anchored by one of the various means, such as the deadman shown in Figure 6. By reeling in on the winch the vehicle is pulled through the obstacle. When a straight pull is undesirable, the A-frame must be used, as shown in Figure 11. In this case, use is made of the winch of the vehicle in trouble.

In most cases, a vehicle not equipped with a winch must be pulled through or over an obstacle by another vehicle. However, a single vehicle having dual tires on the rear, or driving wheels, may

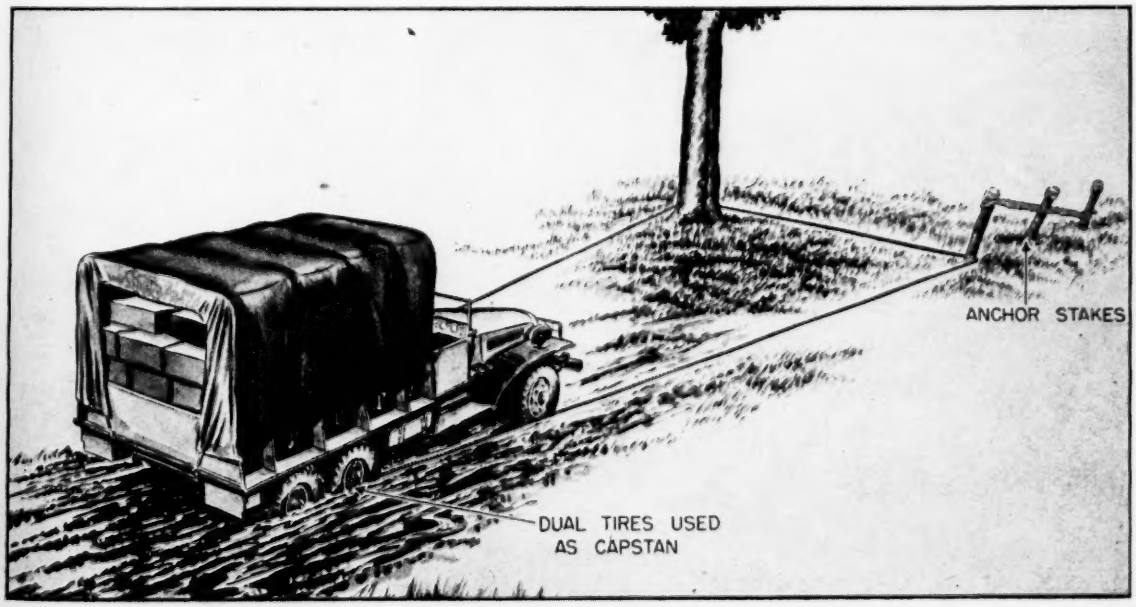


Figure 7.

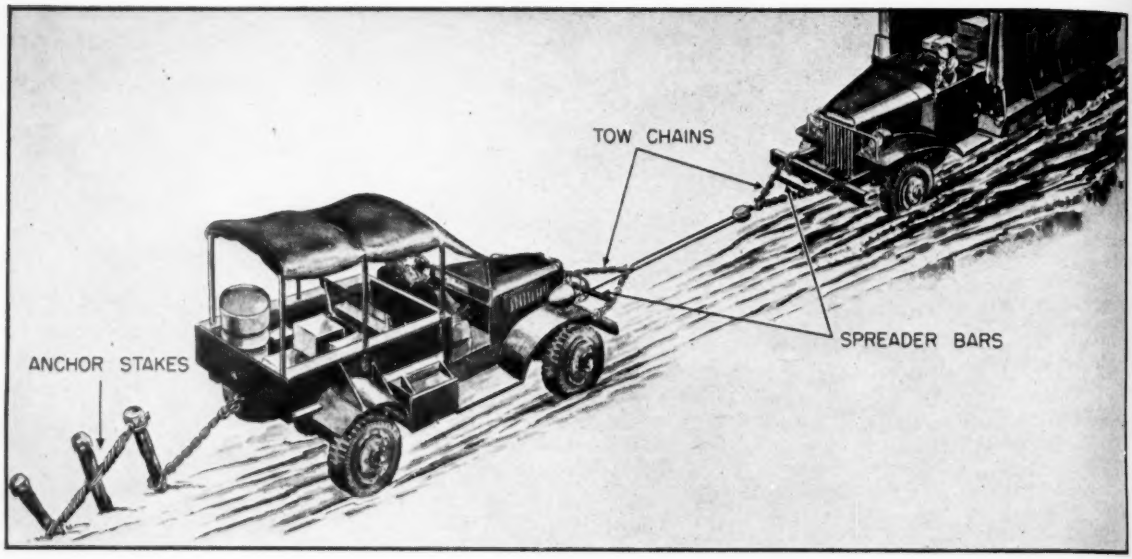


Figure 8.

use these to obtain a capstan effect as shown in Figure 7. A line is run between the tires and a loop brought through one of the holes in the wheel and placed over the drive flange. The line must be passed through holes having no valve stems to lessen the danger of damage to the valve stem. The other end of the line is anchored. When the wheels are driven forward the line winds up between the dual tires and pulls the vehicle forward. The anchors as shown in the figure should be spaced slightly more than the width of the vehicle. In some cases, the two lines might be secured to the anchors, instead of being merely passed around them. This situation might occur when there are two natural anchors present but not at the same distance from the vehicle.

When a large number of vehicles are operating on a motor march, there should be at least one winch truck in the column. The clearing of obstacles is considerably easier when two or more vehicles work together and this is especially true if one of them has a winch. Figures 8, 9, 10, and 11 illustrate various methods by which two vehicles can work to bring one of them through an obstacle.

When a vehicle is overturned, manpower and anchorage can right it by use of the method shown

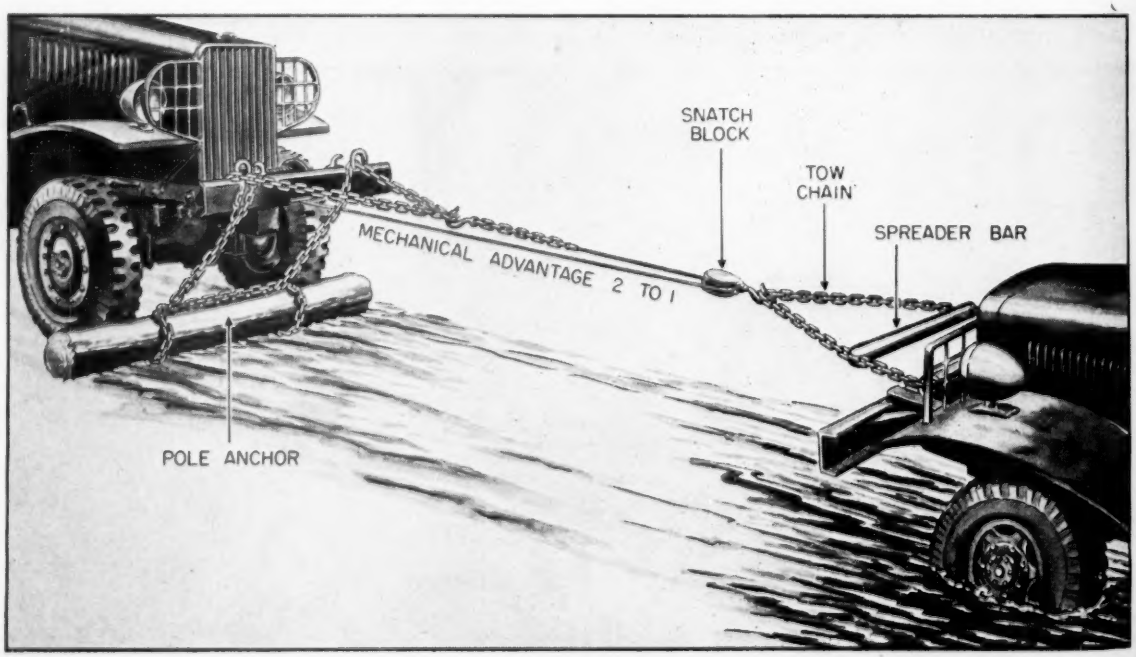


Figure 9.

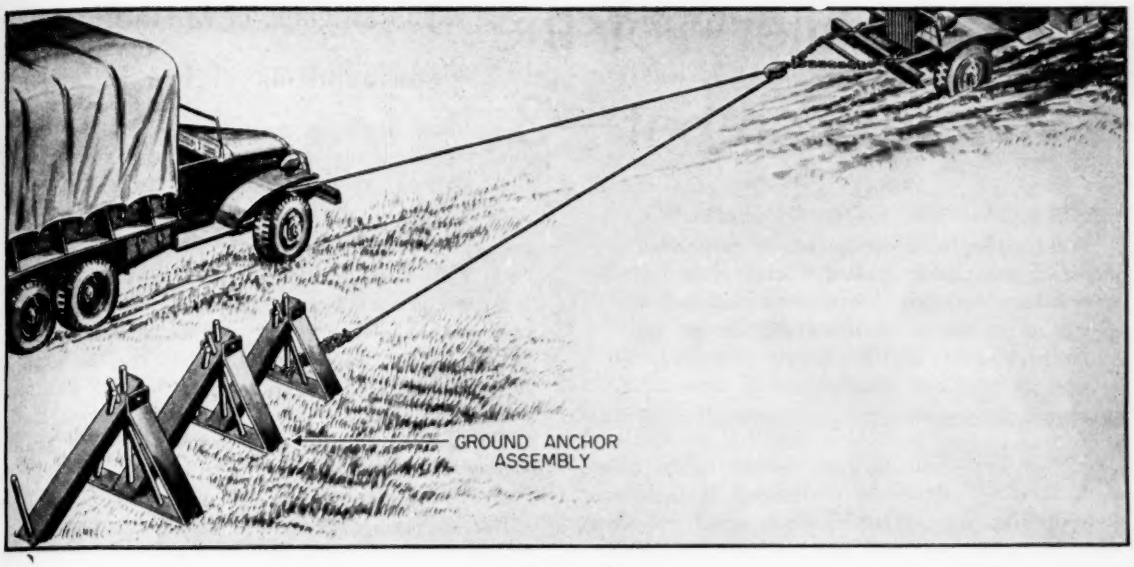


Figure 10.

in Figure 11. The anchorage must be firm. The sling will require 20 feet of one-inch line, plus a block and tackle set, 20 feet of one-inch line for two bridles and the same size line for holding. When installing the bridle lines, care must be taken not to place them over the cab or cowling, on sharp corners, the gas tank, the muffler or exhaust pipe, or weak points of the body. The cargo bed is the most practical part over which to place the bridle. Holding lines should be used to ease the vehicle down after it has passed the balance point and begun to fall.

These methods of keeping vehicles on the move have been proved in the field. With a knowledge and proper application of these various expedients, plus the use of common sense, vehicles can be kept rolling through the many types of adverse conditions which will be met in combat operations.

The desire and need for complete mobility of field artillery, not to mention the mobile character of other units in combat, has brought about the present high degre of mechanization. Many units are equipped with trucks, tractors, or a combination of both. A mud hole or a ravine can have as much an effect upon the outcome of a battle as the proverbial "horseshoe nail."—END

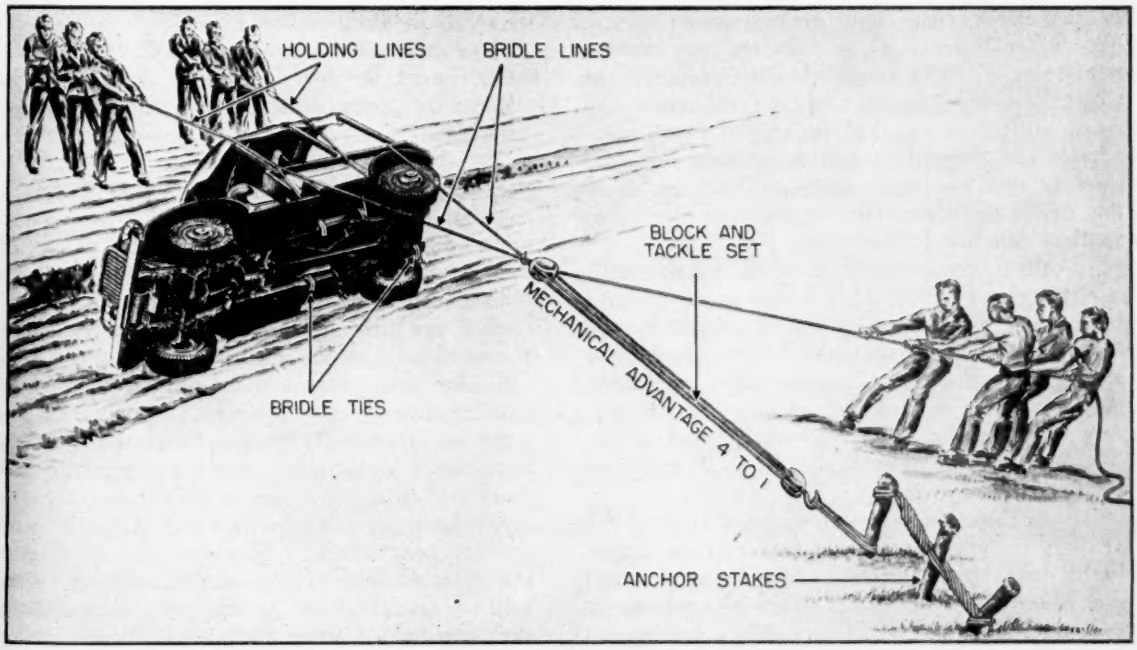


Figure 11.

Corps Artillery of the Army in Combat—3

The assigning of fire missions, and adjusting of fire by air.

By Col. E. M. Edmonson

This is the third article of an authoritative series describing United States Army procedure concerning the organization and operation of Corps Artillery in Combat. Differences with Marine Corps practices, as well as points of similarity, will be noticed.

AN artillery limiting line, usually called a "no fire line," should be designated by each front line division or similar element, short of which no reinforcing unit will fire on its own initiative except after clearing the mission with the division or unit concerned. This applies to artillery of adjacent divisions. This line should be kept as close to front line elements as operations will permit. usually not more than 1,000 yards ahead of advanced elements. Patrols operating in enemy territory should be trained to expect occasional friendly artillery fire in their vicinity.

The location of these limiting lines should be given to the corps artillery fire direction center when designated, and when changes occur. These lines should then be plotted on firing charts and their location transmitted by the corps F.D.C. to all Corps Bns, Div Arty's, TD Bns, Tank Bns and AA Units.

Close supporting fires should be controlled by division commanders who are responsible for requesting such fires. These calls are answered by reinforcing artillery subject to the limitations of ammunition expenditures. In the event reinforcing corps artillery is engaged on an important corps mission and the call cannot be answered it should transmit such call to the corps artillery fire direction center to be answered by the general support artillery subject to the same limitations.

The general principle is that calls for fire originating with an individual or a unit proceed by the fastest and most direct means of communication directly to the firing unit which is responsible for answering such a call. Communications and liaison must set up in such a fashion as to permit this. Any other system of communication and liaison is wrong, and any delay caused by an intermediate headquarters is wrong.

Counterbattery missions are ordered by the corps artillery fire direction center on targets of opportunity discovered by ground and air observers, and such observed counterbattery shoots take precedence over any other type of corps artillery fires except massed fires necessary to repel a major attack. Any observer should be permitted to call directly on any corps artillery unit for an observed counterbattery shoot within the normal zone of the unit.

Area counterbattery shoots are handled by the corps fire direction center and are delivered upon enemy guns located from air photographs. ground and air observers, sound locations, radar locations and locations gotten from verifiable sources.

When enemy artillery is present in considerable strength, it will usually subdivide itself into sectors corresponding to the tactical disposition and plans of the enemy forces. When the counterbattery intelligence map shows such a grouping, the enemy front should be blocked off an the counterbattery intelligence map to correspond with enemy artillery groupings.

A counterbattery program should be planned for each of these enemy sectors, assigning missions to all artillery with the corps which can reach these locations. Priority in assigning missions should be enemy guns accurately fixed, enemy guns not so accurately fixed, and finally, suspected localities. These prearranged counterbattery programs should be changed as often as the location of the enemy guns change and missions should be kept current for all units concerned.

When enemy artillery is active and the source of enemy firing cannot be determined from ground observation, air observation, or the observation battalion, shelling reports will indicate the sector.

If casualties to our troops or other damage is being caused, the offending enemy artillery can be silenced by simply ordering counterbattery program Able, Charlie, or whatever code name corresponds to the sector involved.

Accurately fixed locations are fired first. If this does not stop the enemy's shelling, locations not so accurately fixed are fired, and finally, suspected localities are attacked, if necessary.

This method has proved extremely effective in combat and provides a means of quickly placing a mass of artillery fire upon active enemy batteries.

Similar programs should be prepared for enemy antiaircraft weapons and such programs are fired to assist our friendly bombers. When our bombers approach, a code signal from them puts the program into effect.

Air bombardment should be coordinated with artillery counterbattery fires and also naval gunfire when available. Particularly menacing enemy artillery groupings can be effectively dealt with by such coordinated action.

The maintenance of some counterbattery can

often be delegated to TD Bns and AA Artillery in an artillery reinforcing role. Sudden bursts of rapid fire at irregular intervals will maintain effective neutralization.

Harassing and interdiction programs are planned in a similar manner. They should be coordinated laterally and in depth and, when practicable, fired on an irregular time schedule which will cause a large number of guns to fire simultaneously over a wide front and thus prevent enemy observation agencies from concentrating on any particular battery or battalion.

In emergencies, to expedite the massing of all available artillery fires within the corps zone on targets of importance, the following procedure should be followed:

a. When the corps artillery officer desires to mass artillery fire beyond the capabilities of the corps artillery, a code word, followed by coordinates, zone to be covered and time, should be transmitted, by the most rapid means available, to all artillery with the corps. The corps artillery officer and division artillery commanders will assign this mission to all their units capable of firing on such target, unless such units are engaged in critical missions.

b. When division artillery commanders require a concentration of fire exceeding the capabilities of units under their control, they may request this massed fire by transmitting the code word to the Corps Fire Control Center by the most expeditious means setting forth the nature and location of the target.

c. (1) A typical mesage is as follows:

"Code Word" 055321 Zone 400 yards 1125A."

(2) The coordinates given denote the center of the area to be covered. The zone indicates the depth of the area to be covered. 1125 hours is the time at which the first volleys are to arrive on the target.

(3) A typical request is as follows:

"Request 'Code Word.' 055321, Zone 400 yards. Forty tanks assembling."

Unless a time is stated in the request, it will be assumed the mission is to be fired at the earliest practicable time to achieve the effect of both surprise and massed fires.

d. Procedure:

(1) Each battalion, firing on a frontage of 100 yards for light artillery and 200 yards for heavy and medium artillery, and centered on the coordinates given, neutralizes the indicated zone. If it is desired to cover wider frontages than those indicated above, either several missions will be fired successively on different center points, or the message sent to different units will designate different center points.

(2) Repetition of any mission may be obtained by calling, for instance:

"Repeat Code Word 055321."

When a time on target for a certain time is given, battalions will fire so that all projectiles of the initial volleys will burst at the given time.

When TOT "at my command" is given, battalions will report when they are ready. The fire direction center will give "stand by, time signal—now." S-3s press their stop watches at the command "now." Impact time (TOT) will be exactly — seconds later. Each S-3 subtracts the time of flight for his center battery from the indicated number of seconds and gives the command "fire" at the expiration of the determined time.

Report of completion of fire will be made to the fire direction center ordering the TOT.

Adjustment of long range artillery by fighter type aircraft requires a high degree of coordination between artillery units firing and the observing plane. The Army Air Force is responsible for providing the necessary radio communications between the artillery unit conducting the firing and the aircraft adjusting the fire. A good method is to have several jeeps equipped with appropriate air corps radios assigned to the corps artillery fire direction center and serviced by trained air corps technicians. These jeeps can then be sent to artillery battalions as desired. This method has been used successfully on many occasions.

The success or failure of any mission may depend on several factors. Faulty communication may cause the shoot to be abandoned; enemy heavy antiaircraft fire many hinder the mission; failure of the observer to follow good procedure may delay the fire for effect; but by far the most dangerous threat to the success of the mission, the plane, and the life of the observer, is interception by enemy fighters. Every effort must be made to keep the time required for adjustment to the minimum. The time of shoot must be agreed upon and the battery laid ready to fire on a selected base point at the agreed time. Pilots should be briefed carefully as to the mission and the communication to be used. If the target cannot be accurately located a small area must be designated in which the target can be found. This requires close cooperation between the corps artillery S-2 and S-3.

There are two types of missions:

a. Adjustment of long range artillery for subsequent transfers of fire when terrestrial observation or observation by Air O.P. is impossible.

b. Bracket adjustment for counterbattery or other remunerative targets such as troops, vehicle concentrations, and enemy supply installations.

In both types it is imperative that a definite target or area should be given before the pilot takes off.

Adjustment: For Transfers of Fire. This is used only when a registration is needed for subsequent transfers of fire. A base point that is easy for the pilot to identify from the air is selected. Time of mission is agreed upon and the battery is laid and ready to fire with map data on the selected base point at the agreed time. Both pilots are briefed

as to the mission and instructed to obtain radio contact and the pilot designated as weaver does contact the ground, the weaver pilot takes over the mission. The procedure is as follows:

THE WORD "ROGER" RECEIPTS FOR EACH MESSAGE

Pilot to Ground	Ground to Pilot	Remarks
Call sign—Topic	Call sign—Mabel	Pilot arrives over area, identifies target and reports in.
(1) Mabel from Topic, I am ready to observe.	(2) Topic from Mabel, Battery is ready—45 seconds	Time of flight is needed by pilot to allow him to be in position to observe.
(3) Fire	(4) On the way (5) Splash	Battery is fired at command of pilot. "Splash" is transmitted two seconds before expected time of impact of shell.
(6) 200 right, 200 short	(7) Battery is ready	
(8) Fire	(9) On the way (10) Splash	

In many instances, due to terrain or weather, it will be difficult or impossible to observe single rounds of HE fired during adjustment. When such is the case, the observer will request smoke or battery salvos. The battery will then continue the adjustment using single rounds of smoke or battery salvos of HE, with converged sheaf.

When the observer splits a 100-yard bracket or considers that the adjustment is sufficiently close, he sends "Fire for Effect." The battery then fires one salvo of HE with a converged sheaf. The observer senses the salvo as a whole (a salvo mixed or bracketing in range and deflection should be sensed as "range correct, deflection correct") and the battery or Battalion F.D.C. can then compute the adjusted data.

Bracket Adjustment: In bracket adjustment, on any type of target, if the target cannot be accurately located a small area in which the target can be found is designated. This area should not exceed a 1500-yard square. It is suggested that in the case of hostile batteries, the battery first be located in a general area by sound or flash. This area is given to the observer who is left to search out his target therein. To accomplish a speedy and simple adjustment, there is selected in the area a prearranged point on which the battery is laid and ready to fire at the moment the observer locates his target and asks for fire. The observer then adjusts the fire from the initial round on to his target. The prearranged point should be a prominent terrain feature so that the observer can identify the area in which to expect the initial round. The observer seeks a 100-yard range bracket before fire for effect and if conditions permit will remain in the area to report the results of the fire for effect. The following procedure should be used:

THE WORD "ROGER" RECEIPTS FOR EACH MESSAGE

Pilot to Ground	Ground to Pilot	Remarks
Call sign—Topic	Call sign—Mabel	Pilot arrives over area and searches out target; upon identifying it and prearranged point he reports.
(1) Mabel from Topic Enemy battery well dispersed. I am ready to observe	(2) Topic from Mabel Battery is ready —45 seconds	Time of flight is given to observer.
(3) Fire	(4) On the way. (5) Splash	Battery is always fired on command of observer—battery fires on prearranged point. "Splash" is transmitted two seconds before expected time of impact of shell.
(6) 400 left, 400 short	(7) Battery is ready	Observer adjusts fire to target from initial round.
(8) Fire	(9) On the way.	
	(10) Splash)	

Observer continues to adjust until he obtains and splits a 100-yard range bracket or has a round fall close enough to call for fire for effect. To obtain *rapid* results, all adjustment fire should be by battery salvos, while volleys are used during fire for effect. Thus, some effect will be obtained on the target during adjustment. The observer will find salvos easier to sense than single rounds.

If the observer discovers that, due to communication difficulties, he can receive only when directly over the ground radio, he may ask that one or two minutes be added to the time of flight. Thus, the observer having asked that one minute be added, the battery will send "On the Way" one minute before the guns are actually fired. The time between the report "On the Way" and the impact of the shell then will be one minute plus the time of flight.

It is possible that in some instances the ground set may be able to receive the aircraft set but the aircraft not receive the ground. If this case does arise, the mission can be carried out by one-way procedure. This is accomplished by the observer sending "Mabel from Topic—revert to one-way procedure." The observer then pauses for three minutes and sends "Mabel from Topic—Fire." This three-minute interval is to allow the battery sufficient time to issue commands and lay the piece (s). The battery, upon receiving the command "Fire," times the firing so that the round will fall two minutes after the command is given by the observer. The observer senses the rounds and waits approximately two minutes before sending "Fire." The adjustment is continued with two minutes before sending "Fire." The adjustment is continued with two minutes invertal between sensings and the observer's command to fire. All messages transmitted by the observer will be repeated once.

The fourth and final article in this series will appear next month.

To the Editor

DEAR SIR:

Considering the astronomical number of rounds of naval gunfire which have been delivered in support of Marines since the beginning of the war, there is probably no really important aspect of our amphibious technique which is less understood, or about which more misconceptions circulate. This point is illustrated by the paragraphs dealing with naval gunfire support in Lieutenant Colonel Cushman's otherwise excellent prize essay, "Battalion Landing Teams in Amphibious Operations," which appeared in the January issue of the GAZETTE.

"A TCS jeep radio is used with a TBX as a standby." This is incorrect. There is only one TCS radio jeep in the gunfire elements of an entire division, and that is at division headquarters. The battalion shore fire-control party employs either the SCR-284 or the TBX, two of which are with each battalion supported.

"The spotting officer is at the OP and the liaison officer remains at the jeep relaying spots." This is wrong on two points. First, the spotter works directly through his own radio, and is in direct contact with the firing ship. Second, the function of the liaison officer is distinctly not to stand by the mythical jeep, and relay information or spots. His primary duty is to be with the battalion commander, advising and assisting him just as a field artillery battalion liaison officer does.

"The first round is usually smoke—and is usually way off." Waiving the question of accuracy, about which one might argue forever, the first salvo (*not* round, since naval gunfire is adjusted by salvoes) is virtually always high-capacity or antiaircraft common shell, unless it is intended that the entire concentration is to be smoke, in which case adjustment will be conducted with that type of ammunition. In general, we adjust with the ammunition we plan to use for effect.

MAJOR R. D. HEINL, JR., Naval Gunfire Officer,
3d Marine Division

The Division of Plans and Policies, Headquarters Marine Corps, in reference to the foregoing letter says, "The statements made by Major Heinl . . . are correct according to latest shore fire-control party organization and Naval gunfire procedure."

Lt. Colonel Cushman, in answer to Major Heinl's letter, offers the following:

"I stand corrected on the NGF communication setup, having inserted a vehicular radio where none existed. This jeep radio belongs to the air liaison party at Jasco and has no function in NGF. My mistake.

"On the question of Spotter and LnO, I still maintain that the LnO should be at the Bn CP and not with the Bn Cmdr unless the latter is also at the CP, which is very seldom in combat. At the CP he has access to the situation map and all communications affecting operations, which information he relays to the ship. The Spotter should be at the point offering the best observation of the Bn Z of A. This, of course, is the OP. Since the Bn Comdr is at the OP quite often it follows the Spotter and the Bn Comdr are often together.

"As to adjustment of fire by smoke rounds, my statement applies to heavily wooded terrain and is correct as written although NGF doctrine is different. In such terrain the burst of an AA common or HC salvo cannot be seen. One gun was therefore employed as a range finder, using smoke one round at a time until on. The proper method, as stated by Major Heinl, will be used whenever we get out of the woods which I hope will be soon."

The Marine Rifle Squad in Combat—3

Even though the defense is assumed only as a temporary measure, care must be taken to insure that the defense will prove capable of stopping an enemy assault.

THE purpose of defensive combat is to gain time pending the development of more favorable conditions for launching or continuing an attack or to hold the enemy with a small force on one front in order to employ a larger force elsewhere. The defense is assumed as a temporary measure during the period that precedes offensive action. Regardless of the length of time a unit may be on the defense, a defensive attitude should never be considered other than as a temporary one. A squad takes up the defensive only on orders of the platoon commander.

The mission of a front-line unit in defense is, with the suport of other weapons, to stop the enemy by fire in front of the main line of resistance and, if he reaches it, to repel his assault by close combat. No withdrawal from MLR positions will be made except on verified orders of the platoon or higher commander.

When assuming the defense, the platoon commander assigns each squad its mission. The squad accomplishes its mission in the defense by: Taking and keeping under fire enemy targets in the squad sector that are within effective range. Covering with rifle and automatic rifle fire areas not covered by the fires of machineguns. Protecting the machineguns, mortars, and antitank guns that may be emplaced within the squad position. Ejecting with all available means, such as grenades, knives, bayonets, etc., any enemy who penetrates the position.

Types of Defense

Defensive positions are classified as either hasty or deliberate. The terms "hasty" and "deliberate" are relative. The extent to which a defense is prepared is limited only by time and available facilities. A defense is considered a "deliberate" one when there is time for a thorough reconnaissance of the position to be defended, organization of the ground, and coordination of the fires of all weapons. In the hasty occupation of a position, the first considerations are to get the troops on the position, to provide local security, and to start digging in. As time permits, coordination with adjacent units is accomplished.

Assumption of the Defense

There are four steps in the assumption of the defense: Reconnaissance and selection of position. Establishment of security. Formulation of plans and issuance of orders. Occupation of the position and organization of the ground.

After receiving the platoon defense order, the squad leader makes as thorough a reconnaissance as time permits. In making this reconnaissance, he takes his team leaders with him if at all possible. He carefully examines his sector to determine its best features for defense. He must bear in mind the requirements of a good defensive position, which are: Good fields of fire, cover and concealment, commanding ground for observation, and covered routes to the rear.

With these requirements in mind, the squad leader considers the following: The limits of his squad area. The squad sector of fire. The location of machineguns that may be in the squad sector. The flanks of adjacent squads. Areas which might permit the enemy to approach the squad position undetected or under cover and which must be covered by fire. Covered routes to the rear.

The squad leader then decides where to place each fire team and AR. Before making the final decision as to how he will employ his squad, the squad leader should go out to the front, flanks, and rear of his position and look at it from the enemy point of view.

Having decided on his plan, the squad leader first orients his men by pointing out prominent terrain features. He then issues his orders, such as those on the next page, which give—

(1) All the information he has of the enemy, such as where? how many? what doing? The earliest time and direction from which enemy attack may be expected. Also, all information that the squad must know of friendly troops in the area. This will include a statement of the platoon mission; the location of the outpost line of resistance, the location of combat ourposts, or adjacent units, and the location and sectors of fire of supporting weapons such as machineguns, mortars, etc.

(2) Mission of the squad.

(3) Assignment of fire positions and sector of fire to each fire team; the location and sector of fire of each AR. Priority of work. (The usual priority is clearing fields of fire, digging foxholes, and camouflaging.) Security.

(4) Information regarding ammunition, that is, how much ammunition will be on the position initially and how the ammunition supply level will be maintained. (The amount of ammunition to be kept on hand will be prescribed by the platoon commander.) Food, water, entrenching tools, and barbed wire.

(5) Location of the squad leader's position and

also of the platoon commander's observation post.

Normally a squad leader will give his order to the entire squad; however, circumstances may arise when it will be necessary for the squad leader to give his order to the three team leaders. They, in turn, would give their orders to their fire teams.

The squad leader is responsible for the security of his squad at all times. The first thing the squad leader must do after moving his squad into the position to be defended is to provide local security to the front, flanks, and rear. This security is established regardless of that provided by higher units such as battalions and companies. One man from each fire team is normally adequate for this purpose. These men must be informed of the location and activities of our combat outposts, outguards, patrols, and other friendly troops in the immediate area. They must know the password for the day.

The primary duty of men posted as squad security is to give warning of any enemy activity that may endanger the squad while it is digging in. When the enemy is sighted, men acting as security must immediately inform the squad leader as to where the enemy is, what he is doing, how many there are, and what weapons the enemy has. If the men on security cannot personally return and warn the squad leader or other members of the squad of enemy approach, they will do so by a prearranged signal. This signal may be rifle shots, blasts on a whistle, and so on. Reliefs must be arranged so that men on security have time to dig and prepare their own positions. A sentinel should not remain on post for longer than two consecutive hours.

There are three classifications of fire positions in the defense, primary, alternate, and supplementary. The primary fire position is that which offers the best conditions for handling the mission. The

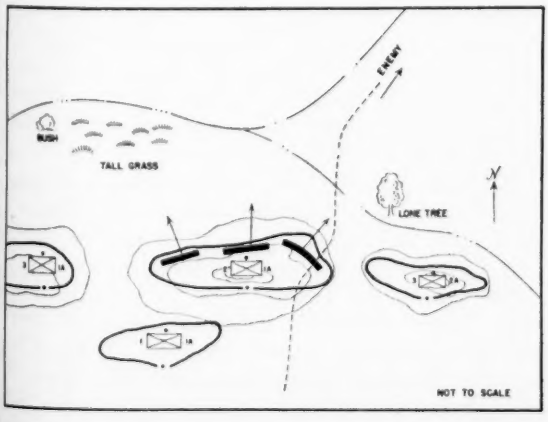
Example of Orientation and Order Given by Squad Leader

THIS is where Joe's patrol was ambushed the other day. North is in that direction (pointing). The Nabu River is about 75 yards east of here (pointing).

Strong Jap patrols are operating near a village four miles up this trail (pointing). They are screening a strong force. We may expect an attack any time after dark.

Our platoon is going to defend along the general line of that trail (pointing), this hill, to the other side of that tall grass (pointing). The 3rd squad of the 2nd platoon is about 10 yards to the right of that trail (pointing); the 3rd squad of our platoon is about 25 yards on the other side of that tall grass (pointing); the 1st squad of our platoon is in reverse slope positions in rear of this hill (pointing). The 3rd platoon is out in front on security now and will use the trail for reliefs tonight.

Our squad will immediately organize, occupy, and defend this hill to deny its use by the enemy. Our right will be about five yards on the other side of that trail (pointing), our left will be about here.



Our sector of fire will extend from that tree (pointing), to that bush (pointing).

Joe, put your fire team on the right of this hill with your AR right there so it can fire down the trail. Your sector of fire will extend from that tree to the stream junction over there.

Bill, put your fire team down there on the forward slope. Put your AR in about there, paying particular attention to that small stream bed to your front. Your sector of fire will extend from the right of that trail (pointing) to the right of that tall grass.

Sam, put your team over there on the left side of this hill and your AR in that area paying particular attention to tall grass area. Your sector of fire will extend from that bush to the stream junction over there.

When you get your men in position, I'll sight in your ARS.

Dig in, clear fields of fire and camouflage at the same time.

Engineer tools and wire will be here in an hour. I'll let you know when they arrive.

When I give you the word, each fire team will send one man back to get chow for the rest of the team.

The corpsman will be near that stump.

The aid station is 150 yards down that valley.

The password until 0800 tomorrow will be Rising and the countersign will be Sun.

The platoon CP is over there in that clump of trees.

The company CP is 50 yards down that draw. I'll be right here with Bill's fire team.

Any questions?

It's now 1610.

Okay. Let's get started.

alternate fire position is a position from which the same fire missions can be executed as from the primary position. Alternate positions must be chosen by the squad leader in case enemy fire makes the primary position untenable. The route from the primary to the alternate position should afford concealment and cover from enemy observation and fire. The alternative position should be located at such distance from the primary position as to be outside the effective bursting radius of light shells directed at the primary position.

The supplementary fire position is one from which the squad can accomplish secondary fire missions which cannot be accomplished from primary or alternate positions.

In the assignment of a primary fire position to each fire team, the squad leader seeks places that afford the best field of fire, cover, and concealment, consistent with the exercise of control. The positions chosen must be such that the fire of the three teams will overlap so that all the ground within the sector of fire assigned the squad is covered.

The position for each AR must be such that the three ARs of the squad together can cover the entire front and flanks of the squad and the front of adjacent squads. Each AR is assigned a principal direction of fire that covers specific important terrain features or gaps in the defensive fires of supporting weapons. ARs also cover small draws, stream beds, or other approaches. The ARs are most effective when they are located on the flanks in such manner that they can deliver oblique or flanking fire on enemies approaching the position.

The team leader assigns the positions for the riflemen in his team and indicates to each man his sector of fire. These sectors are assigned to cover any gaps that exist after sectors of fire for the ARs have been designated.

When the squad leader has assigned all his positions, he meets with leaders of adjacent squads to arrange for mutually supporting fires and for contact. This must be done as soon as possible for the squad leader may have to alter some of his positions. While the platoon leader is charged with this coordination, the squad leaders are expected to assist him.

As soon as the squad arrives at the position assigned, the organization of the ground commences without delay. Organization of the ground is the building up of a defensive position by clearing fields of fire, constructing field fortifications and camouflaging. These tasks are carried on simultaneously. Clearing fields of fire is commenced early. Naturally vegetation should be disturbed as little as possible. Only brush, grass, and low-hanging limbs of trees which interfere with observation are removed. The squad sector of fire will include the fronts of adjacent squads and, therefore, fields of fire must be cleared across the fronts of these squads.

Digging foxholes is the first step in the construction of field fortifications. Foxholes may be large enough for one, two, or three men, as ordered. Several considerations affect the size and shape of the foxhole. It is as small as practicable in order to present the minimum target to enemy fire. It is wide enough to accommodate the shoulders of a man sitting on the fire step. It is elongated to the extent necessary to permit the use of large size intrenching tools in digging it. Its depth from the surface of the ground to the fire step depends upon the height of the man who is to occupy it, but under no circumstances is it less than four feet. The depth should permit the occupant to fire his rifle or other weapons while standing on the fire step. Additional depth for a sump is dug in one end to provide space of the occupant's feet so that he may sit comfortably and have adequate clearance. Another benefit derived from the sump is that a Marine crouched in the foxhole with his feet in the sump is able to push himself up through the debris thrown on top of him by the crushing action of a tank.

In most types of soil the foxhole as thus constructed gives positive protection against the crushing action of tanks which pass directly over it in any direction, provided that the Marine crouches down in the hole so that there is a two-foot clearance between him and the ground surface. If the soil is very sandy or very soft, it may be necessary to revet the sides of the foxhole to prevent its caving in.

The spoil excavated from the foxhole is piled all around the hole as a parapet, leaving a shelf wide enough for the Marine to rest his elbows upon while firing his weapon. It should be spread low, and the parapet made at least three feet thick in order to provide protection against small-arms fire. An all around parapet made of the spoil excavated from the foxhole will be approximately six inches high. Before commencing to dig, the Marine must skim off the turf or topsoil over an area ten feet square and set the material aside for latter use in camouflaging his parapet. Upon completion of the foxhole, he places his camouflage material over the spoil in a manner to imitate the surrounding ground.

If intrenching tools are not available to rig foxholes, anything, such as canteen cups, knives, meat cans, and meat can covers, should be used. *The important thing is to dig and get cover!*

Surprise on the defense is as necessary as surprise in the attack. Camouflage measures start with the movement to the defensive position. If foxholes are placed in the open, overhead concealment must be constructed to prevent discovery by

This article is based on information in Manual NAVMC-3729, recently issued by Marine Corps Schools at Quantico, and is presented in this form as a GAZETTE feature.

aerial observation or detection on aerial photographs.

All artificial obstacles, such as wire, tank traps, etc., are placed so as to direct the enemy movement into exposed areas and hold him there under fire. These obstacles must be placed in woods, tall grass, brush, or otherwise hidden if possible. They must be covered by fire at all times to prevent the enemy removing, destroying or surmounting them.

Tactical obstacles, such as double apron fences, concertinas, or a combination of both, are placed to hold the enemy in areas covered by defensive fires—particularly in the line of final protective fires of machineguns. Two parallel rows of double apron fence or a pyramid of three concertinas fastened together by strands of barbed wire have proved to be very effective obstacles.

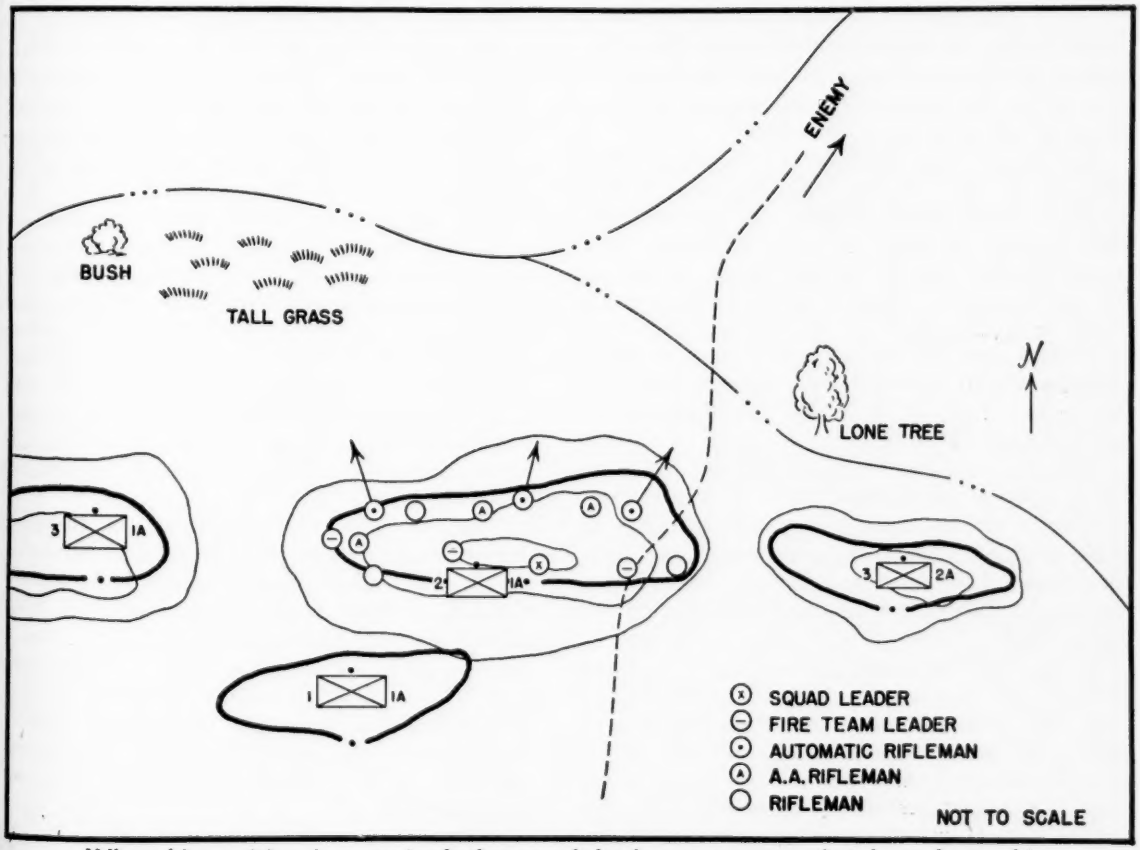
At all times when wire is used, there should be some alarm system attached to the wire. One of the simplest and most effective alarm systems is a few pebbles in empty tin cans, which are fastened to the wire.

Protective obstacles, such as a single four-strand wire fence should completely surround the platoon defense area. Such obstacles are set up to hinder a surprise attack by the enemy. They must be placed beyond hand grenade throwing range.

Alternate and suplementary fire positions must be selected and constructed. Properly camouflaged communication trenches should be constructed between primary and alternate fire positions. Alternate positions may be ocupied from time to time on orders from the platoon commander in order to deceive the enemy. It is desirable that the position of the automatic weapons be changed at night from that position which was occupied during the day, since the day positions may have been located by the enemy. Supplementary positions are occupied when it is necessary to cover avenues of approach which cannot be covered from the primary position.

When his position is organized, the squad leader prepares a rough sketch of the squad sector and submits it to the platoon commander. This sketch on the order of that shown below gives the position of each man, fields of fire for each weapon, prominent terrain features within the sector, with the estimated ranges to each, and location of wire and booby traps.

In most cases the Japanese attack at night. Experience in recent operations has proved that the squad leader will probably find it necessary to order that each man set out stakes to mark the limits of the sector assigned him. When it is necessary to fire at night, each man will be able to feel these stakes and fire effectively within his sector.



When his position is organized the squad leader prepares a sketch such as this for the platoon commander, showing positions of men, fields of fire, and other details.

A defensive position is never finished. It is constantly improved. The construction of alternate and supplementary positions, the improvement of camouflage, the checking of ranges, and other improvements, such as the placing of wire, warning devices, etc., will be carried on continuously.

A rifle squad is frequently detailed to cover with fire a tactical obstacle such as a road-block or a tank trap. The members of the squad must be so placed that they can cover both the obstacle itself and its flanks. The men defending the obstacle must be concealed from hostile observation and at such a distance from the obstacle as to be out of the zone of dispersion of artillery and heavy mortar fire directed at it. At night the men occupy positions closer to the obstacle but beyond hand grenade throwing range from it. The squad leader should establish guards to prevent casualties to friendly troops or vehicles.

Conduct of the Defense

The conduct of the defense must be aggressive. Success in the defense depends on each platoon, squad, team and Marine holding his place and repulsing or killing the enemy. *Under no circumstances will a squad abandon its defensive position unless ordered to do so by the platoon or higher commander.*

During a bombardment that normally precedes a hostile attack, the members of the squad take cover in their prepared positions. As soon as the artillery and mortar fire or aerial bombing lifts, fire positions are taken to meet the attack.

The enemy is not engaged by riflemen or other weapons emplaced on the main line of resistance until he comes within effective range of rifle fire. At this time, all weapons on the MLR open accurately aimed fire to stop the enemy before he reaches the battle position. Where fire is to be opened on order or signal, members of the squad must hold their fire, even though the enemy may be within effective range, until the order or signal to commence fire is given. Thus, the full effect of surprise fire will be realized.

Automatic weapons that fire repeatedly from the same position will be located by the enemy and destroyed. When fire is received that threatens to make a primary fire position untenable, that position should be vacated and the alternate position occupied. This will normally be ordered by the squad leader.

In the event that tanks precede or accompany infantry, the tanks are engaged by antitank weapons. The primary mission of the rifle squad is to take under fire the infantry who accompany or follow the tanks. If there is not accompanying infantry, some members of the squad will fire at the vision slits, bogey wheels, and periscopes of the tanks to cause them to "button up" and thereby reduce their maneuverability and control. Men equipped with antitank grenades fire on the tanks when they come within effective range. Men immediately in the path of oncoming tanks will protect themselves against crushing action. After the tanks have passed, they will be attacked from the rear by AT grenadiers.

If the enemy reaches the area covered by planned close-in defensive fires, machineguns shift to final protective lines and mortars fire on their primary target areas. Riflemen and automatic riflemen increase their rates of fire against the most threatening targets. If the enemy assaults, he is met successively by fire, grenades, and hand-to-hand combat.

When an adjacent squad position is penetrated or overrun, the squad leader shifts a portion of his fire to that area to prevent the enemy from widening the breach and enveloping nearby units. Should the squad position be threatened by envelopment or attack from the rear, the squad leader orders the occupation of supplementary positions as necessary to meet this threat. The squad leader takes advantage of darkness, fog, smoke, and lulls in firing to improve the defensive position of his squad and to establish contact with adjacent squads and with the platoon commander.

Combat Outposts and Outguards

A unit occupying a position on the main line of resistance provides for its local security by establishing a combat outpost. A combat outpost is composed of a number of groups varying in strength from a fire team to a rifle platoon. These groups organize defense areas on positions affording observation and good fields of fire.

If the terrain affords good fields of fire and covered routes of withdrawal, supporting weapons are attached to the combat outpost. When supporting weapons are employed, close rifle protection must be accorded them. Security for the outpost is provided through patrols and forward observers. The combat outpost engages the enemy with long range fire and withdraws before the enemy reaches the area of close combat. The withdrawal is made along previously designated and reconnoitered routes.

Front line units through whose area the withdrawal is made are informed when the combat outpost is about to commence withdrawal and when it has cleared their front. When combat is interrupted by nightfall, battalions in contact immediately push forward combat outposts. In this case, the combat outpost sends forward patrols to gain and maintain contact with the enemy. Combat outposts are often detailed to hold key features such as stream crossings, villages, and important road junctions.

A squad, or fire teams from a squad, may be detailed as an outguard of an outpost. Outguards should be located within visual communicating dis-

tance of each other. If the terrain prevents this, contact is maintained by patrols, radio, and telephones if the latter are available. Patrolling between outguards is carried on during all periods of reduced visibility under normal terrain conditions. Communication with the battalion command post is maintained by wire, radio, and messenger.

Outguards, not exceeding the strength of one squad, occupy day positions (usually within 400 yards of the combat outpost position) which afford the best views over the foreground. Outguards are numbered from right to left. At night outguards are posted so as to cover the most probable route of hostile advance.

The support commander prescribes the location of the outguard, and the number of sentinels. The outguard commander selects the posts for sentinels so that the sector will be kept under observation. Sentinels are designated as "Sentinel No. ——, Outguard No. ——, Support No. ——." During the day they are placed primarily to observe; at night, to listen. The positions of the sentinels at night should be different from those occupied during the day. Any talking at night must be in whispers. Members of the outguard not posted as sentinels rest nearby under cover (natural cover if available, otherwise foxholes) but remain fully equipped and close to their weapons.

Sentinels are given the following information:

Concerning the enemy, they are told of his direction, patrol or other activity in the area, and the special sector to watch. Concerning our own troops they are told the location of the support and outguards to the right and left; number of his relief. Any patrols which have gone out and will return through his post. Where prisoners are to be taken and where messages are to be sent. Special signals, such as gas alarm and countersigns. Names of features of military importance, such as roads, villages, or streams.

The fourth and final article in this series will appear next month.

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What's New

Trends of Military Interest.
By T/Sgt. Ray Moulden

¶ In line with the War Department's conception of offensive use of tanks, a new American vehicle, the T-26 General Pershing, is ready for European combat use. This is a heavier weapon than the Sherman, but not so heavily armored as the original heavy tanks designed by this country and scrapped after a short time. It has less armor than the big German Tigers which are so heavily armored that they are unwieldy on offense and are vulnerable to our tank destroyers and other weapons. High degree of attack maneuverability, with the tank designed primarily for use against infantry remains the tactical aim of our armored forces, according to Lieut. General George Patton, whose recent explanation of the use of lighter Shermans in lieu of weapons as heavy as the German Royal Tiger, may be considered the final authoritative word in the long-standing allied tank controversy.

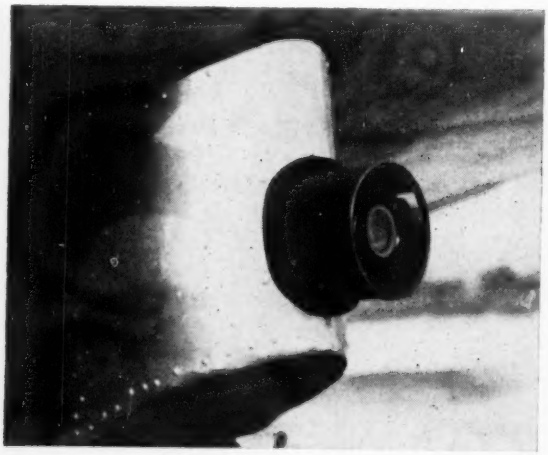
¶ Marines used some 5,000 gauze surgical masks on Iwo Jima as protection for nasal passages against the sulphur dust and volcanic ash of that strategic island. The Red Cross rushed the filters to the island as one means of cutting down on the difficulties of the operation.

¶ Blood plasma now has been delivered to embattled troops by virtually every known means. Latest is firing the vital replacement in artillery shells to Allied troops cut off by Nazis in Europe. According to Maj. General Paul R. Hawley, surgeon to the European Theatre of Operations, this means of delivering plasma was successful. He indicated also that pre-invasion estimates of plasma requirements were far too low and that instead of one transfusion required for every five wounded, average battle experience has shown the need for one transfusion for every two men wounded.

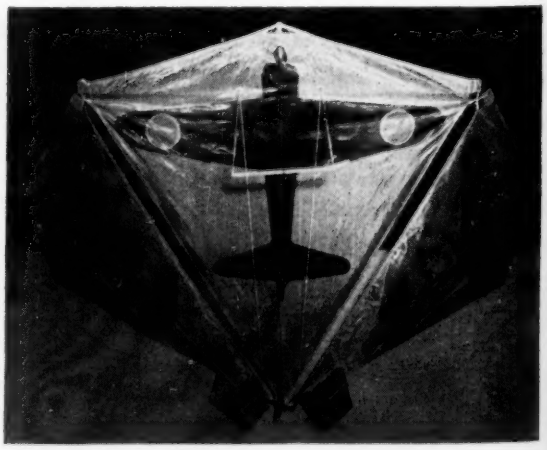
¶ Use of rockets as land-based artillery finally has been acknowledged by the Allied commands in Europe. (Land-based rockets were first used in the Pacific a year ago). British and Canadian batteries are similar to those originally perfected for antiaircraft fire and for naval bombardment. The barrage from 12 projectors, each with 32 barrels, is said to equal the fire power of 280 5.5-inch guns firing shells weighing approximately 100 pounds. To develop this fire-power with normal artillery, 3,000 men would be employed, whereas the comparable rocket barrage requires only 20 men.

¶ The British have ordered their first jet-propelled air liner, to be used in postwar service. So far as is known, this is the first planned use of jet propulsion by allied governments in peacetime commercial air transport.

¶ Incendiary bombs being used in the current Tokyo air strikes are filled with a new type of jellied gasoline being manufactured by some 20 California firms, according to procurement officers of the Army's Chemical Warfare Division. The new M-69 bombs weigh six pounds, are dropped in "aimable" clusters of 500 pounds which hold together for 5,000 feet, then open into a series of smaller patterns. On contact, the bombs spray flam-



This standard K-25 camera, mounted under a plane's wing, photographs aerial operations.



Six-foot target kites with Jap plane silhouettes on them help train Navy antiaircraft gunners.

The Privateer PB4Y-2, a Navy land based patrol bomber, is marked by its single tail assembly and side gun turrets. These bombers now fly in the Pacific war zone.

ing gasoline for a radius of approximately 30 yards.

¶ The British Army has a new Q Branch. Its job is to retrieve the equipment and material strewn by men and officers over beachheads and battlefields in the heat of combat, sort and identify the recovered goods, and arrange for its return to owners at a later date. This retriever service includes personal effects as well as war materiel.

¶ The new British Volcano bombs, weighing 22,000 pounds, are so powerful that in experimental use off the coast of England, the first projectile dropped obliterated a small granite island. In another instance, observers a mile away saw a bomb hurl chunks of earth 10 tons in weight into the air. A dud, filled with ballast instead of explosive, buried itself so deeply that 18 men had to work 12 hours a day for nine days to dig it out. In the explosion on land, the British Information Service states the projectile displaced many thousands of tons of earth, and caused subterranean explosions which continued long after the main blast. The British plan to use the huge bomb eventually in the Pacific, claiming it will destroy Japanese artillery, munitions, men and machines, no matter how deep they are buried under reinforced concrete.

¶ Army Air Forces have standardized a new speed indicator which shows the safe air speed for a plane as well as the actual flying rate. It is designed to make the extremely high-speed fighters safer, particularly important with the advances in streamlining and increased horsepower, since as the speed of an airplane approaches that of sound, pressure of air on wings and tail surfaces is greatly boosted. Speed of sound varies at different altitudes, hence designers found that a stationary indicator of safe maximum speed for altitudes near sea level did not serve as safeguard at higher levels of flight. The new indicator has a movable red line to indicate maximum air speed the craft will stand, plus the conventional yellow air speed pointer. Thus the pilot has but to watch that the speed registered by the yellow hand does not exceed that shown by the red.

¶ A new and more powerful version of the Avenger torpedo bomber, the TBM-3, is in use by the Navy, seeing action in recent carrier strikes on Japanese home islands. Powered by a Wright engine providing faster takeoff, greater speed, stepped up climb and longer range, the TBM-3 is the only carrier-based plane so far with facilities for carrying a 2,000-pound torpedo or the equivalent in smaller bombs. Its fire power has been increased some 200 per cent by wing guns, underwing rockets.

¶ A new concrete-piercing fuse designed to make possible the reduction of pillboxes to rubble on direct hits, is being used by American artillery according to Col. Robert C. Downie, chief of Pitts-

Consolidated Vultee Model 37 is a spectacular airliner planned for post war civilian travel.

A heating bag can double as a float for Army Air Force crewmen forced out over the water.

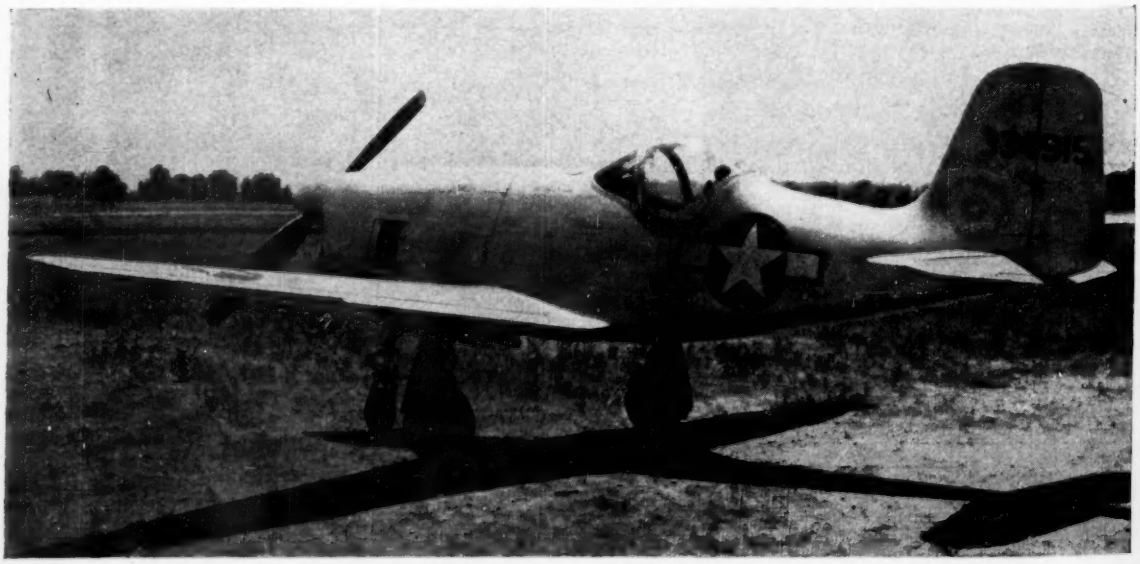
burgh Ordnance District. The fuse is unique in that it can be screwed to the nose of every artillery shell from 75-mm gun to 240-mm howitzer shells and is strong enough to pierce reinforced concrete before explosion occurs.

¶ Lightweight artificial legs with interchangeable parts soon are to be made available to war veterans under plans of the War and Navy Departments. Made of light metals, plastic or fiber, the new leg has improved joints approved after test by the Federal Bureau of Standards. It is result of study by the National Research Council in cooperation with the Army and Navy. A complete assortment of various parts will be available at amputation centers so that each may continue the policy of making custom-built legs for individual cases.

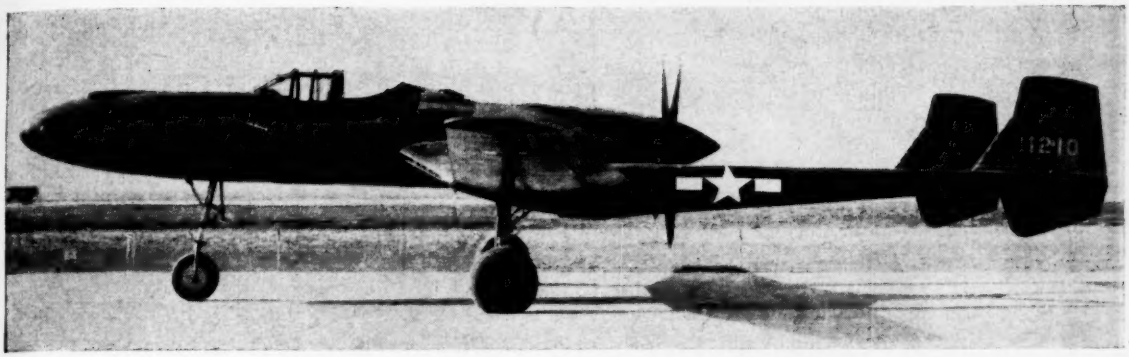
¶ The small attack boats in which the Third American Army dashed across the Rhine in an astounding coordination of Army and Navy skills, were manufactured from raw plywood and actually transported to Germany within a month from contract signing to date of final delivery, according to the War Department. The boats were sent by air from factory area to fighting zone. The order for manufacture of 669 boats was received February 1 and materials rushed to plants and the jobs completed in about three weeks, the Department stated in sending congratulatory messages on a "production miracle" to the Sentry Boat Co., Manastee, Mich., Minnetonka Boatworks, Wayzata, Minn., Foster Boat Co., Charlevoix, Mich., Pine Castle Boat Co., Pine Castle, Fla.

¶ Floating repair shops made of concrete and capable of being put into operation within 24 hours of reaching destination, are now in use in the Pacific, speeding the major repairs often necessary for motorized equipment. The shops are 269 feet long and are towed by Naval ships to the beaches where needed. Each has 100,000 cubic feet of storage space and the type used for engine conditioning has a yearly capacity of 10,000 engines; that for tires can retread, vulcanize and repair 400 tires daily, while a third is used as a floating supply depot.

¶ The Navy now has a floating hotel for flyers and other combat personnel. It is fully equipped with all conveniences and is floated near the active areas



The Bell XP-77, an all-wood fighter, has been proposed as a fighter-trainer due to its feeling of high speed. Its performance does not equal a conventional plane's.



An elevator in this Vultee XP-54 gets the pilot in and out of the cockpit. Forward swept wings, thin airfoil, flushriveted skin lower the drag of the experimental ship.

and used as a temporary rest haven. According to the Navy, the "floatel" is the equivalent of a normal commercial hostelry in an average American city.

¶ A young scientist, youngest man to be commissioned in the Navy in this war, has been made an ensign and assigned to Annapolis for research work as a result of the successful designing of a detector tube which is capable of spotting gas in production enterprises and setting in motion corrective equipment prior to explosions. The tube was originally designed to combat a serious series of explosions in synthetic rubber plants which for many months hindered the huge rubber substitute program. However, the tube is so designed that it can be installed in planes, ships and other mobile weapons and perform the same detection and corrective functions as in production plants. The young officer has been awarded $10,000 a year for life by a large manufacturer as minimum royalty on the detection device.

¶ Oil spray, shot into the air from generators having the appearance of old fashioned fire engines, formed the huge fog that successfully screened American and allied troops in recent operations against the Germans on the northern European front commanded by British Field Marshal Sir Bernard Montgomery. Standard Oil Company of New Jersey developed the smoke mixture in cooperation with the National Defense Research Committee and the Army Chemical Warfare Service. The "smoke" can envelop an entire town in an impenetrable fog and is fired into the air from generators in the same manner as steam hisses from a locomotive, hitting the air at a velocity of more than 1,000 feet a second. It is composed of millions of droplets so small that 40,000 would make up only an inch of fog. They are light enough to float in the air but are not readily dispelled by wind. The screen is particularly effective because it throws a reflected glare back at observers.

¶ The Germans have been using three-barreled rocket guns, firing 200-pound explosives with range of 5,000 yards as a close up mortar for troop support. They are highly mobile and provide excellent close support fire power, according to reports from the Rhine fronts. They are called "screeching mimies," and are larger than the rocket mortars used for the first time by the Germans on the Russian front.

¶ The Royal Air Force now has in operation a new jet plane said to be faster than the Nazis' V-1 flying bomb, which has a speed of 400 miles an hour. Presumably this new plane could overtake a V-1 and explode it in the air before it could damage British territory. The Ministry of Aircraft Production also disclosed that a jet fighter is in primary production stages which is being built on aerodynamic principles and will be capable of speeds faster than sound or better than 720 miles an hour.

¶ The new *Midway*, 45,000-ton aircraft carrier, largest and fastest ever launched, will carry a new type of aircraft never used in combat, according to Assistant Navy Secretary Artemus Gates. The huge craft is first of her class of five, can handle 80 twin-motored planes, is nearly twice as large as the *Essex* class ships, can throw up an almost impenetrable cover of antiaircraft fire and mounts up to five-inch guns.

The following list shows the source from which each picture in this issue was secured. All pictures not credited are either official Marine Corps or Navy photos.

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A Marine Learns Judo

By Warrant Officer J. N. Swearingen

THERE is only one way to learn judo, and that is the hard way! It cannot be taught by mail nor can it be learned in ten easy lessons nor any number of easy lessons. If you would be a master of judo, be prepared for two or more years of hard work.

For all practical purposes the terms judo and jiu jitsu are synomymous. Jiu jitsu was practiced in ancient China and Japan an estimated 2000 years ago. It has gone through many phases of development and there have been innumerable schools originated by many masters. So we find our subject under different names: jiu jitsu, ju jutsu, yawara, tai jitsu, judo, and so on. The fundamental arts remain the same in all legitimate schools, but emphasis is placed on various phases.

Judo is a modern school of jiu jitsu developed in Japan within the past 50 years by Professor Kano. His school emphasized the contest or sports angle and gained tremendous popularity, especially with the youngsters. This popularity has caused the name judo to become the accepted word for all schools of jiu jitsu.

Yawara was a school of jiu jitsu in ancient Japan but now it is considered an elementary course in most schools. Despite this fact, a newspaper story on the subject of combat training at one of the military camps not long ago described Yawara, taught there, as a new super-judo that made ordinary judo seem a child's game by comparison. I'm afraid that paper's readers received a false impression. Yawara is not super-judo. But it is my opinion, based on observation and reading, that these beginners' arts actually pass for judo in most gyms and training camps.

There are few legitimate schools of judo open to Americans today, nor were there many in the past. The war has made little difference. Even in prewar Japan it was difficult for a white man to learn more than yawara. Among those schools that did welcome the white "barbarians" was Henry Okazaki's school of Ko Den Kan, located in Honolulu. Ko Den Kan means "old style way" and was a school of jiu jitsu emphasizing all forms of unarmed combat.

My own experience as a student in one of the Okazaki classes can serve as an example of what judo really is and how it is learned. This particular class was held at the Army and Navy YMCA in Honolulu before the war, and was instructed by three fine athletes and former students of Mr. Okazaki: Dick Rickerts, boxer; Denzell Muggy, amateur wrestler and weight-lifter; and Don Carver, professional wrestler. Through the influence of these three men, old style jiu jitsu received an American touch which may give origin to another "modern" school. The American trend is making judo aggressive rather than purely defensive.

I joined the class through curiosity and became so interested that I spent two years in it. Although I am six feet two, weight 230 pounds and have had a background of football and boxing, judo for many months was a rough experience. I was thrown so many times in one practice session that I became exhausted from getting up! I attended six (three to four hour) practice periods a week for the first year and averaged four per week for the second year, finally graduating to an instructors' class and an occasional contest with visiting Jap sailors.

In brief, this is an outline of the courses taught in this class, allowing an estimated four to six months for the mastery of each phase: The complete course covered about 450 basic arts and many more than a thousand variations. Colored belts are awarded as symbols of proficiency. All schools do not award belts on the same basis, but fundamentally the idea is the same—to separate students into groups according to their progress. There are no weight divisions in judo as in wrestling and boxing. In practice and contest, men are matched according to the belt worn. The 120-pounder will often be paired with the heavyweight and will be expected to hold his own. However, don't take too seriously the notion that with judo the weak little fellow can overpower the big bully by a simple twist of the wrist. That a small man can overcome a big man is based on fact—provided the small man has the speed, coordination, and knowledge to offset his opponent's weight and strength. This knowledge and skill will not be acquired overnight.

First phase: *Yawara* or elementary judo. This course consists of holds and breaks from holds in the standing position and is often described as "police judo." Instruction begins with the art of falling. It is obvious that a fair proficiency should be gained in falling before beginning the throwing practice. During this phase lessons are given in disarming methods, physical conditioning exercises, resuscitation methods, and massage. Beginners wear the white belt.

Second phase: *Nage no kata* or throwing arts. These include 25 selected throws chosen from an original course of 60. There is continued practice in the elementary work. Studies are made in *Karate*, or Chinese fighting with the open hand. Completion of this phase usually entitles the stu-

(Continued on page 68)

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(Continued from page 66)

dent to the blue belt. (Awards of belts are at the discretion of the instructors.)

Third phase: *Shime no kata* or combination arts. This course involves 25 throws followed by submission arts on the mat (similar to American wrestling except the participants wear the judo jacket.) *Randori*, or contest, practice begins at this time. No belt is given for completion of this phase.

Fourth phase: *Oku no kata* or advanced combination arts teach 35 more submission arts following the throw. Practice continues in all previous courses and students are given training in *Sumo*, or Japanese wrestling. Other supplementary work completed by this time includes the Japanese method of fighting with the closed fan from which the police club arts were adapted, defense against the Samurai sword, defense against the boxer, and practice in American wrestling. The latter two studies are American adaptions, of course. Completion of this phase with required skill in performance entitles the student to the brown belt. (Japanese schools usually awarded the brown belt upon completing the third phase.)

Fifth phase: *Shinin no maki*, *Shinyo no maki*, and *Shingen no maki*. These are the "secret" arts, about 100 of them and are taught to wearers of the black belt only. The proper application of these arts will result in serious injury or death to op-

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ponents, therefore they cannot be taught indiscriminately. The black belt, worn by instructors, is given to men selected from the brown belt group who are outstanding in skill, knowledge, and character.

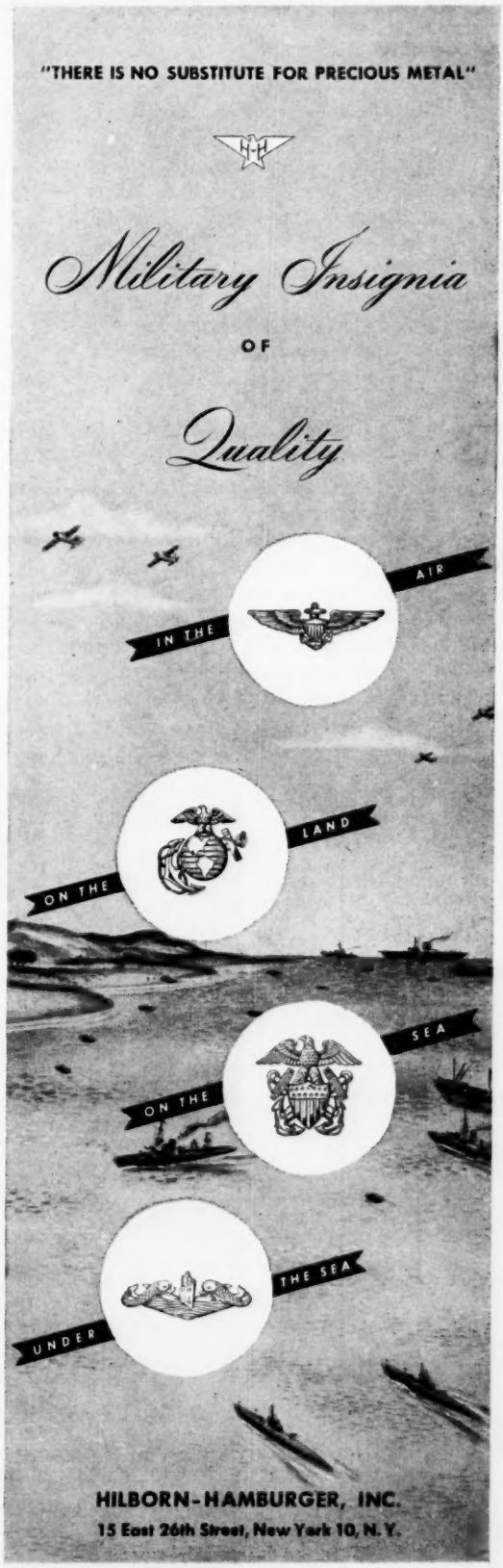
This brings out an odd situation—the student must graduate before he can complete the course. Another method of winning the black belt is by Randori. By concentrating on two or three throws and a like number of mat arts, the student may become so skilled that he may choose to enter the contest tournaments. Success here can earn the black belt but will not make the wearer eligible for the fifth phase of instruction. It has been my experience that few Japs know more than contest judo.

It is plain that such an extensive, time consuming course cannot be added to military training, except in time of peace. That satisfactory short courses can be taught was demonstrated by the Second Marine Division's individual combat school held at Camp Elliott in 1942. This school, I am sure, was one of the best of its kind ever conducted in the Marine Corps, up until that time at least. It was organized by Captain (now Lt. Colonel) William A. Kengla, an expert in judo, who planned the course to include advanced bayonet training, knife fighting, use of the police club, disarming, and judo; all well seasoned with various physical conditioning exercises.

The bayonet and knife work was based on the Colonel Biddle system of hand-to-hand fighting. The disarming methods, like the police club arts, were adopted from judo and included work with the pistol, knife, bayonet, and club. The object of this school was to train instructors who would in turn pass on their knowledge to their own units, at such time as training schedules would permit.

As instructor in judo in this school, I tried to select those arts most useful to the marine. We dispensed with the Japanese words and substituted such names as "lariat strangle," an art from the course *Oku no kata;* the "flying mare" and "thigh sweep" from *Naga no kata;* and "coat hold throw" from *Shinin no maki.* In other words, the arts and variations were chosen from all phases of judo—rather than the elementary phase only. The whole course included about 20 arts and twice as many variations. Each class was limited to three weeks, so to teach falling was out of the question. The problem of falling was solved by teaching a few effective throws and letting nature take its course. For mat holds we emphasized strangles and the Japanese arm-bar. Practice in contest work was given on the third week, also disarming practice with the bare blade. The course was rough—it was planned that way. Graduates of this school were not judo experts, but they were satisfied that what they learned was the real thing.

Speaking of strangles, judo makes a fine study of this art. This may surprise you, but strangling



is the best of all submission arts and the least harmful! Properly done, it stops the flow of blood to the brain with resulting unconsciousness. A blow on a certain nerve center in the back, and the victim snaps out of it, none the worse for wear. It is true that in judo many things are taught that are not in harmony with American ideals of sportsmanship. Some of them, especially in the advanced courses, can be classed as "dirty" fighting. It is all in the point of view. But judo does not endorse bad sportsmanship. In fact, the exponent of judo can usually win a fight with less damage to his opponent than one who uses his fists. But "dirty" methods are taught and for a definite purpose—to defend one's life. Disarming the knife wielder is another story. "Dirty" tactics can be ethically employed here, and why not? So the instructor has a great responsibility in teaching discipline and building character.

In most discussions of judo, the fact is presented that invariably in mixed contests, the judo champion is decisively beaten by the boxer or wrestler. This sounds good but those who know will readily recognize the judo contestant as a participant in Randori. There never has been a public contest in this country where one of the contestants was a master of judo and fighting for keeps. There is no quarrel between judo and wrestling or boxing, nor

(Continued on page 72)

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(Continued from page 70)

any other form of American sport. Judo is not a sport; therefore it does not compete with any sport. But I do wish to point out that American sports appeal to those men having the most natural ability—the quick and the strong! This is the penalty for over-emphasizing the entertainment value. Judo appeals to those men who need physical development most. It has little spectator appeal, except for Randori. It is one thing to perform before the admiring crowd. It is another thing to take the bumps and bruises of the judo gym, without benefit of applause, and do it for your own good!

Japanese Island Names

The Japanese named the islands of the Volcano and Bonin groups in the early 1850s, using descriptive terminology. Iwo Jima, for example, means sulphur island. The Bonins, known to the Japs as the Ogasawara Islands, were named for Sadayori, Prince of Ogasawara. The Japanese claim he discovered the islands in 1593. The ten largest of the Bonins were named after various members of the family and are sometimes called the Family Islands.—*Quantico Sentry.*

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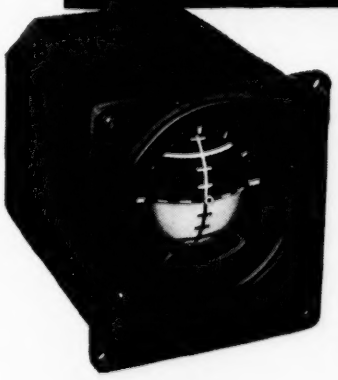

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Preventing Mortar Accidents

A recent malfunction in the firing of an 81-mm mortar, which resulted in a premature explosion of the tube, has resulted in a reminder from the Pacific FMF of the importance of having the safety pin in place and functioning properly.

It is believed that the explosion might have been caused by a defective fuze resulting from the safety pin's not being held in place by the setback pin, or that the safety pin was not in fuze at the time the shell was dropped into the mortar.

To avoid such accidents, the following precautions before firing are urged:

(a) Adjust the propelling charge for the desired zone.

(b) Remove the safety *wire* from the fuze.

(c) Examine for presence of safety *pin*. Hold the round in a vertical position with the fuze end up and test the tension of the safety pin spring by pressing and releasing the pin. Since a premature explosion may result from firing a round in which the safety pin has become unseated, any round found with the pin out will be placed in a safe place for disposal by ordnance personnel.—*Supply Service Bulletin, FMF Pacific.*

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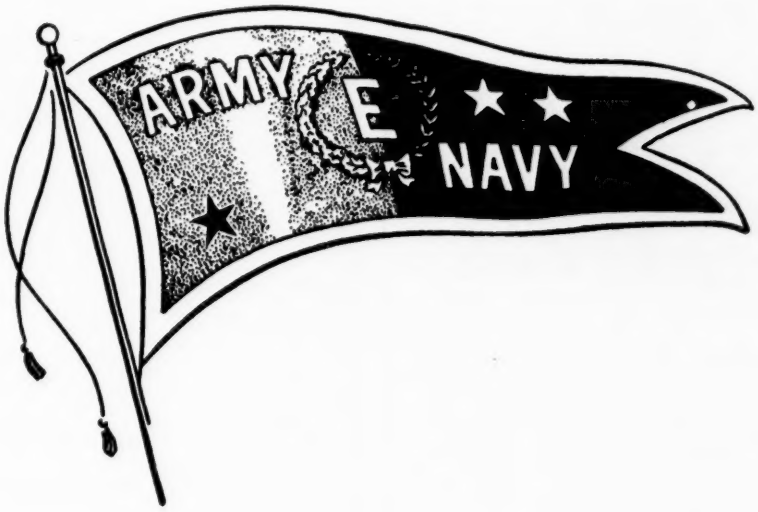

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New Requirements for Officer Candidates

REQUIREMENTS for assignment to Officer Candidates' training have been revised recently by Letter of Instruction No. 969. This letter states that any enlisted man who has served or is serving overseas during this war, and who is considered to be of officer caliber, is eligible for a temporary commission as a second lieutenant. No definite requirements concerning educational standards or age limits are made for application under this policy, but the physical standards specified under earlier provisions are still maintained. Temporary commissions awarded will be in either the regular Marine Corps or Marine Corps Reserve, depending upon the regular or reserve status of the applicant prior to commissioning.

Three hundred of these officer candidates per month are to be selected and returned from units of the Fleet Marine Force, Pacific, for officer training, and the first group of these candidates will begin training shortly after 1 July 1945. No restriction has been placed on the exact number of applications of enlisted personnel from other than Fleet Marine Force units, and it is expected that a large number of these men will enter officer training under this new policy.

(Continued on page 78)

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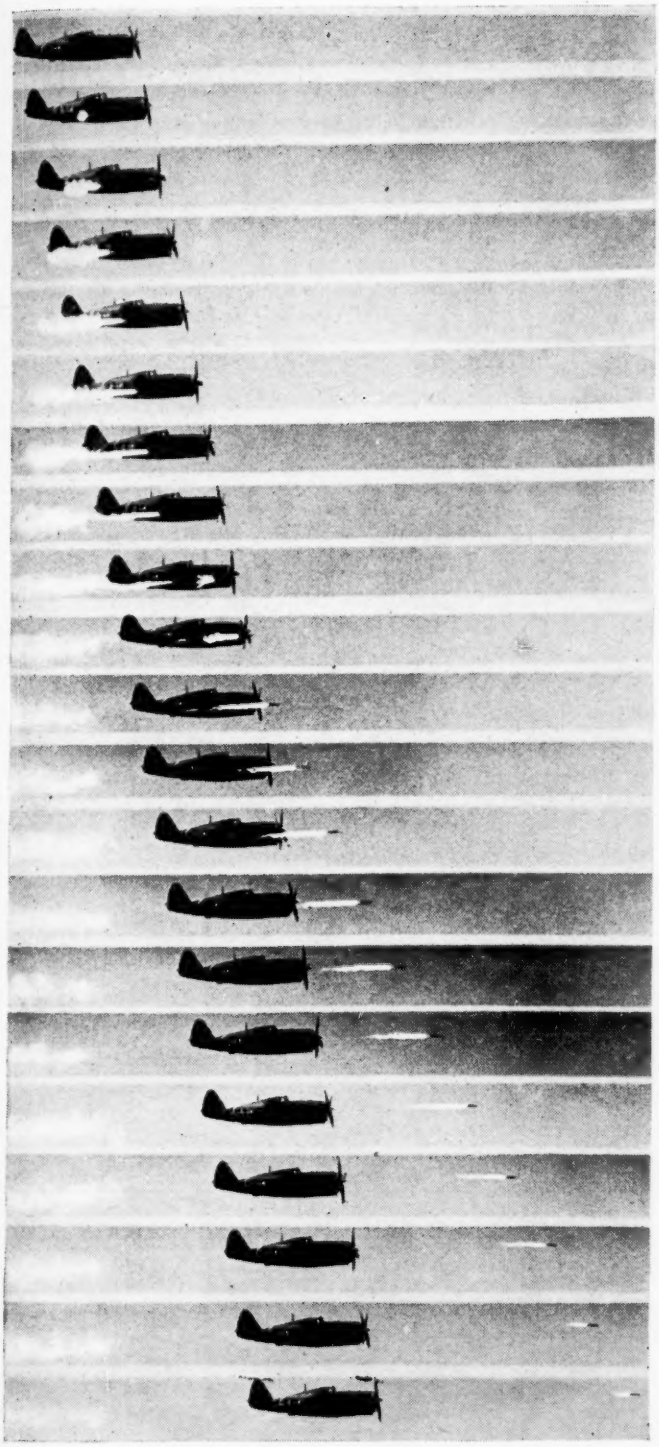

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Our Laboratories are now wholly devoted to the war. When it is won, they will go back to their regular job—helping the Bell System give you the best telephone service in the world.

BELL TELEPHONE SYSTEM

(Continued from page 76)

Enlisted men in the United States who have not served overseas at any time during this war, but who have had two years of college education, remain eligible for officer training under the provisions of Letter of Instruction No. 878. In the case of these applicants, however, they must (a) be recommended by their Commanding Officer, (b) be between the ages of 19-31 inclusive, (c) have a minimum GCT of 110, (d) have at least 15/20 eyesight correctible to 20/20; and be free from malaria for at least six months.

The training program at Quantico for all enlisted men applying for commissions is basically the same regardless of any previous qualifications. After initial screening at the Training Battalion, candidates are sent through a four weeks' course at the Candidates Refresher School, where they all are brought up to an even level of instruction in basic academic and military subjects. They then enter the standard 16 weeks' officer training in the Platoon Commanders' School, on completion of which they are commissioned second lieutenants.

Upon being commissioned, the graduates of Platoon Commanders' School are further ordered to one of the Marine Training Commands—either Camp Lejeune or Camp Pendleton—for a course of eight weeks' instruction prior to transfer to the Fleet Marine Force. In the case of any officers who served in specialist branches in an enlisted capacity, and who were commissioned under these policies, assignment to officer training in those branches at the training commands may be made. Candidates who come from aviation units will, upon commissioning, be assigned to line duties in the Fleet Marine Force.

Revised Property Account Form

SHOWN below is a revised Marine Corps Property Account Form (N.M.C. 748-QM) with a few additional columns inserted which the writer found convenient when wrestling with various property account sections overseas.

The extra columns enable anyone to look up any item, and at a glance the disposition of this particular article is available—be it scattered throughout the battalion, regiment, or any other unit with several responsible officers. Also, stock on hand in the storeroom is recorded on the same sheet, and these totals, i.e., unit amounts plus storeroom amount should correspond with the debit figure.

All this information can be readily compiled while the normal posting process is being done. As a time saver afterwards it is priceless and well worth the slightly extra bookkeeping.

A factor to consider is the necessity of increasing the size of the individual sheets of this form, and also the binder. If a sheet eight inches wide by 12½ inches deep is used, many entries can be made before it becomes necessary to substitute a new sheet, and it is possible to make the width of the columns such that large amounts can be inserted with ease.—S/Sgt. Edward E. Rousar.

In connection with the foregoing, the Division of Plans & Policies, Headquarters Marine Corps, states: "The suggestion . . . appears to have definite value for use in organizational control records and is in use in similar form by several organizations. It is not, however, considered adaptable for use between accountable organizations and the Quartermaster's Office, this Headquarters."

N.M.C. 748-QM. (Rev.)

MARINE CORPS PROPERTY ACCOUNT

REGIMENTAL QUARTERMASTER, THIRD MARINES (REIN.), FMF

(Station or Organization)

Vo. No.	Debit	Balance	Credit	Unit	Price	Unit 1-Bn	Unit 2-Bn	Unit 3-Bn	Unit PkHw	Unit Tk	Unit Eng	Str.Rm.	Remarks
1	432	432		1	14	80	80	80	80	12	0	100	
Balance			Carried forward										

Article: Hammers, Carpenter's, Asstd.

Class II Sheet I Unit Quantity: Each

THE WARRENTON WOOLEN CO.

Uniform Cloths

TORRINGTON, CONN.

THE FAVORITE TIE OF OUR ARMED FORCES

ORIGINAL **4FOLD** NO LINING

UNIFORM TIES

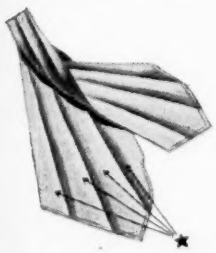
by Beau Brummell

- Tested and approved for construction—washability—durability—and fabric.
- Made of Genuine Palm Beach fabric—woven by Goodall.
- Fast in color—resist perspiration.
- Always retain their fresh new appearance.
- Tie into a perfect dimpled knot.
- Economical too! Will outwear several ties of ordinary construction and fabric.
- The one and only washable tie with patented 4Fold construction.

Notice that this tie has NO inner lining. The 4 folds of the fabric serve the same purpose as an ordinary lining—to give shape to the tie. The fact that the tie has no lining guarantees its perfect washability.

Because of the simplicity of this 4FOLD Construction . . . and because there is no inner lining to bunch up or distort, these fine uniform ties drape into a perfect dimpled knot.

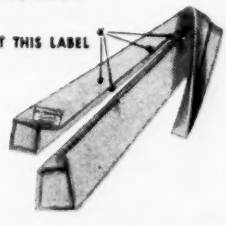
BLACK OR REGULATION KHAKI O. D. 5
PRICE $7.25 PER DOZ. TERMS 7/10/EOM



NONE GENUINE

"BEAU BRUMMELL"
4 FOLD UNIFORM TIE
CONS. U.S. PAT. RE. 20942
FABRIC BY GOODALL
55% WOOL 45% COTTON MFR.224
..WASHABLE..

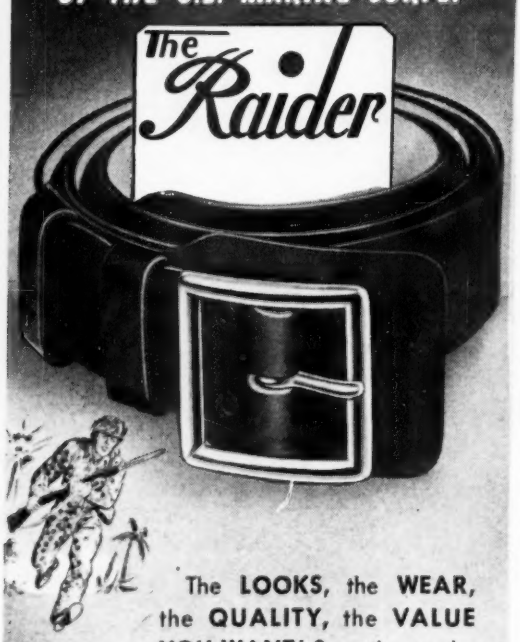
WITHOUT THIS LABEL



The tie when finished and folded is bar-tacked at the side. This unique construction makes it easy to wash—press the tie—and retain its original shape. There is no lining to wrinkle or buckle, such as is found in all ordinary tie construction.

Beau Brummell *Ties,* inc. (4FOLD UNIFORM TIE DIV.) CINCINNATI

WORTHY OF THE ROUGH, TOUGH AND READY TRADITIONS OF THE U.S. MARINE CORPS!



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WILMINGTON, NORTH CAROLINA

NO MILITARY SECRET

Yes sir . . . here's extra flavor for everybody! Just add a dash of Crosse & Blackwell Worcestershire Sauce, or thick, rich C & B Sauce to meats, fish, soups, stews, gravies. . . . Get the habit—ask for these sauces by name . . . keep them on the table.

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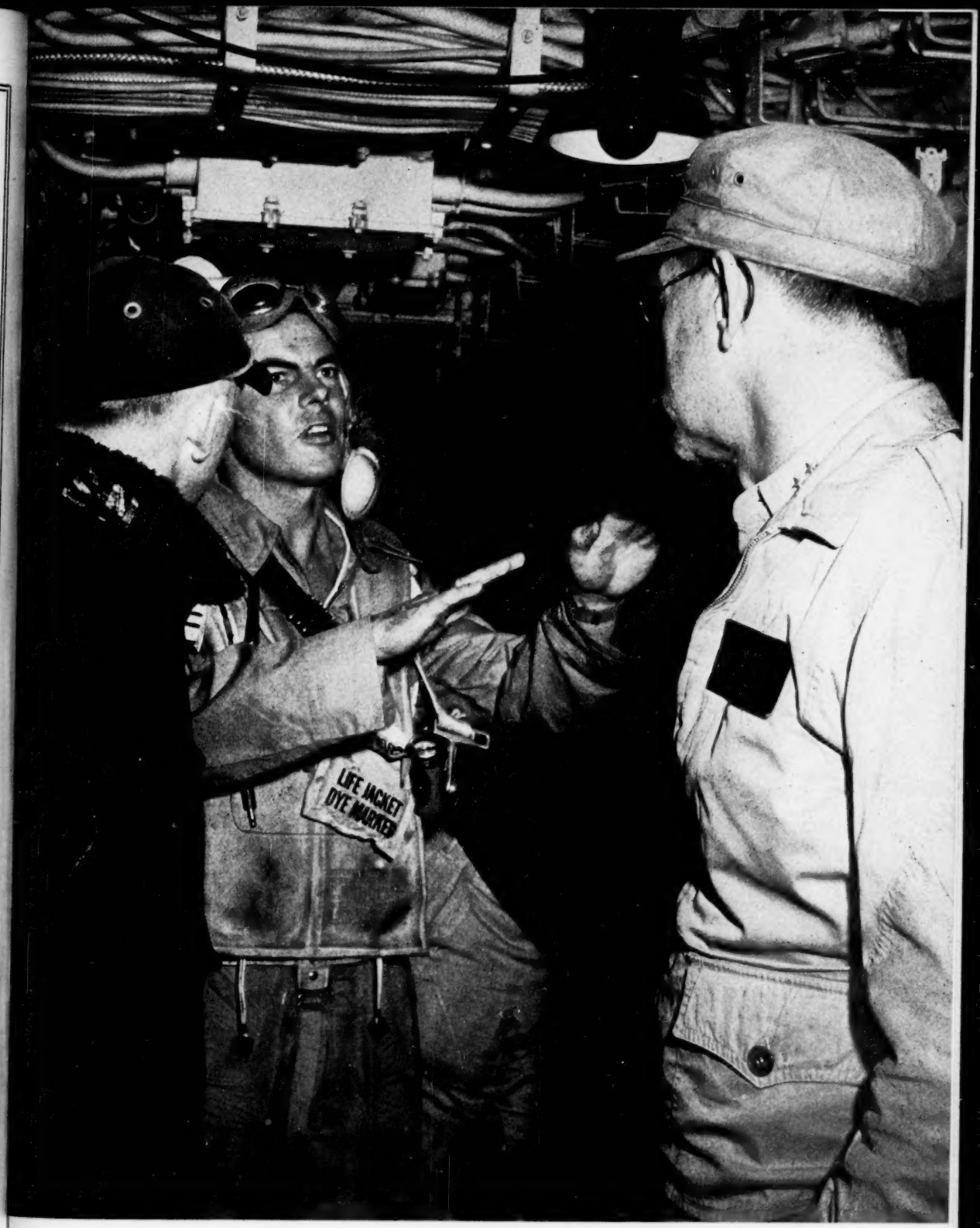
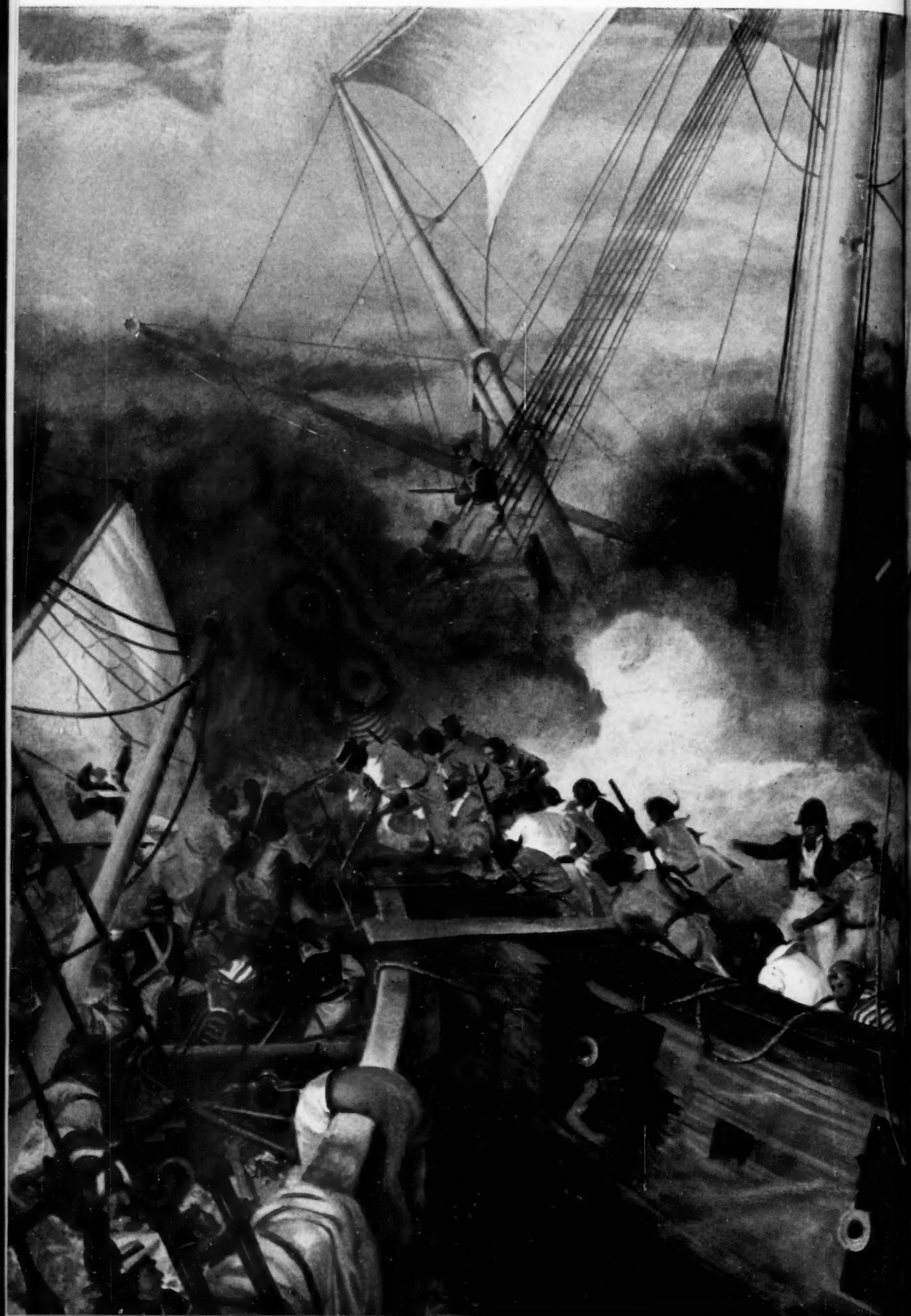


Kill Over Formosa

Lt. Colonel William A. Millington, first of our carried-based Marine aviators to knock down an enemy plane, describes to Rear Admiral Frederick Sherman a Japanese plane's fall over the island of Formosa.